CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
342475.A1.01.T1	I-90 BP-1	SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrasture Mitigation — LOCATION : I-90 eastbound (986498.6 N, 872450.1 E)

ELEVATION : 3238.233 — DRILLING CONTRACTOR : Crux Subsurface (Mike Starling)

DRILLING METHOD AND EQUIPMENT : Burley 4500 Componentized, Core/HWT Casing Advancer

WATER LEVELS : (submerged) — START : 4/28/2006 — END : 4/28/2006 — LOGGER : J. Butler, P.E.

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHINESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	0.1		2			Few gravels overlaying seal. Contact at 0.1 ft with CONCRETE, gray, medium strong (R3), slightly weathered, surface of seal is horizontal.	Driller notes very little very soft sediment on top of seal.
	Core Run #1-HQ Length 5 ft Recovery 100%	92	0	Mechanical break.			Depth to mudline below slipbox = 29.0 ft. Slipbox to pool = 4.2 ft. Pool to mudline = 24.8 ft. Today's pool = 3259.5 ft.
			0				
			1	Mechanical break.			
5	5.1		2	4.2 ft, fracture, 5°, rough, undulating, no infilling, 1 to 2 mm, tight.		Continued CONCRETE, gray, slightly weathered, medium strong (R3), aggregate predominantly rounded gravel up to 2 inches in diameter.	
	Core Run #2-HQ Length 5 ft Recovery 98%	94	0				
			0				
			0				
			1				
			1	Mechanical break.			
10	10.1			Mechanical break.			End Box 1 at 10.1 ft. Start Box 2. Took photos of HQ-3 in splits. Driller notes hole blocked off temporarily at 11.0 ft, retracted drill stem ~6 inches, then advanced past zone to end of run.
	Core Run #3-HQ Length 5 ft Recovery 70%	17				Some 1/2-inch pieces of argillite bonded into bottom of concrete at contact. Contact at 10.95 ft with ARGILLITE, purple-gray, moderately to highly weathered, fractures into gravel-sized pieces with subangular faces, RQD = 0 in ARGILLITE.	
15	15.1					Above 14.7 ft very weak to weak (R1-R2), color change to green-gray below 14.7 ft, slightly better quality (R2).	11.0 to 12.5 ft is presumed zone of low recovery?
	Core Run #4-HQ Length 5 ft Recovery 46%	0		Rock mass heavily fractured throughout.		Continued ARGILLITE, zones of purple-gray and green-gray, very thinly laminated, highly weathered, extremely weak to very weak (R0-R1).	Good fluid return. 10:19 11:12
				No recovery from 17.5 ft. to 20.0 ft.			Driller notes run continuing to back off periodically but "feels" consistently like rock.
20	20.1					Rock mass much less weathered below 19.5 or 20.0 ft, slightly better quality and hardness (R1-R2).	11:34 11:38
	Core Run #5-HQ Length 5 ft Recovery 92%	10		Fractures typically 10 to 35°, smooth, undulating to stepped, little or no infilling (<1 mm), tight to loose, numerous healed fractures. 22.7 to 23.0 ft, very weak and rubbelized/weathered zone.			Good fluid return (pink-gray)
25	25.1					Continued ARGILLITE, purple-gray, moderately weathered, rock quality continues to improve, medium strong (R3), fractured into 2 to 4-inch pieces, zones of green-gray rock are better quality.	End Box 2 at 24.4 ft. Start Box 3. 11:54 11:57
	Core Run #6-HQ Length 5 ft Recovery 100%	0					
30							

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PROJECT NUMBER:	BORING NUMBER:	
342475.A1.01.T1	I-90 BP-1	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrasture Mitigation — LOCATION : I-90 eastbound (986498.6 N, 872450.1 E)

ELEVATION : 3238.233 — DRILLING CONTRACTOR : Crux Subsurface (Mike Starling)

DRILLING METHOD AND EQUIPMENT : Burley 4500 Componentized, Core/HWT Casing Advancer

WATER LEVELS : (submerged) — START : 4/28/2006 — END : 4/28/2006 — LOGGER : J. Butler, P.E.

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	30.1					Continued ARGILLITE, purple-gray, very thinly bedded to laminated, slightly weathered, medium strong (R3).	Continued good fluid return.
	Core Run #7-HQ Length 3.5 ft Recovery 97%	11		Fractures typically spaces every 2 to 4 inches, with many healed and quartzite-filled fractures throughout rock mass.			
	33.6						
	Core Run #8-HQ Length 1.5 ft Recovery 107%	0		33.5 to 33.6 ft, fracture, 10°, rough, undulating, clay infilling 5 mm, open.			Blocked off at 33.6 ft. End Box 3 at 33.6 ft. Start Box 4.
35	35			Fractures typically 35 to 45°, smooth to slickened sided in small areas, undulating to stepped, some clayey surface staining, <1 mm, tight.			
	Core Run #9-HQ Length 2.6 ft Recovery 100%	0				35.4 to 36.5 ft is highly fractured/rubbelized zone, darker purple-gray.	
	37.7						
	Core Run #10-HQ Length 2.4 ft Recovery 42%	0				Recovered mainly gravel-sized pieces of core, purple-gray ARGILLITE.	Blocked off at 37.7 ft. No recovery from 38.7 feet to 40.0 ft.
40	40.1						
	Core Run #11-HQ Length 3 ft Recovery 100%	17		Fractures 10 to 20°, offset dipping, rough to smooth, undulating, <1 mm clayey infilling, tight.		Upper 0.7 ft is gravel-size pieces at core (likely from HQ-10).	13:14 Core fell out of inner tube- pushed back over, but only recovered 1 ft. (HQ-10).
	43.1						
	Core Run #12-HQ Length 2 ft Recovery 100%	0					Driller intentionally stopped run at 43.1 ft. 13:38
45	45						
	Core Run #13-HQ Length 5 ft Recovery 100%	0		Fractures typically 10 to 30°, rough, undulating to stepped, trace clayey infilling (<1 mm), tight.		Continued ARGILLITE, purple-gray with streaks of green-gray, thinly bedded to laminated, slightly weathered with zones of moderate weathering, medium strong (R3).	Continued good fluid return.
50	50.1						
55							Backfilled hole with bentonite chips. Borehole stayed open to bottom after removal of all drill rods.
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
342475.A1.01.T1	I-90 BP-2	SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrasture Mitigation — LOCATION : (986523.6 N, 872543.5 E)

ELEVATION : 3238.633 — DRILLING CONTRACTOR : Crux Subsurface (Mike Starling)

DRILLING METHOD AND EQUIPMENT : Burley 4500 Componentized, Core/HWT Casing Advancer

WATER LEVELS : — START : 4/18/2006 END : 4/18/2006 LOGGER : J. Butler, P.E.

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	0.0						Driller notes very soft from 0 to 3 ft (casing fell as core barrel was drilled down).
	Core Run #1-HQ Length 3 ft Recovery 0%	0				In top of HQ-2, recovered a handful at rounded 1-inch gravels and a piece of steel bar.	
	3.0						
	Core Run #2-HQ Length 2 ft Recovery	75	2			Contact at 3.5 ft with bridge seal (concrete), gray, slightly to non-weathered, medium strong (R3).	13:34
	5.0 90%		0	Mechanical break at 4.0 ft.			Harder at 4 ft.
5			1	Mechanical break at 5.2 ft.			13:46
			0				13:51
	Core Run #3-HQ Length 5 ft Recovery 96%	96	0				Depth to mudline below slipbox = 29 ft. Slipbox to pool = 4.4 ft. Pool to mudline = 24.6 ft. Pool elevation.
			1	Mechanical break at 8.2 ft.			Good fluid return, gray.
10	10.0		0				
			1			Continued CONCRETE (seal for footing), gray, R3, aggregate layers from sand to coarse gravel size, rounded.	14:05
			0				14:10
	Core Run #4-HQ Length 5 ft Recovery 100%	78	1	Mechanical break at 12.2 ft.			
			1			Contact at 13.9 ft, gravel alluvium.	End Box 1 at 12.9 ft. Start Box 2.
15	15.0		-			Contact at 14.3 ft with rock, ARGILLITE, R1-R2, purple.	Driller notes softer at 14.5 ft.
			-	Fractures, 10 to 25°, smooth, undulating, some infilling, loose.		Continued ARGILLITE, purple-gray, finely bedded, moderately weathered, weak to medium strong (R2-R3), massive.	14:24
			-	Fractures typically 5 to 15°, smooth, undulating to stepped, some small amount at clay infilling, loose to tight.			14:28
	Core Run #5-HQ Length 5 ft Recovery 82%	11	-				
			-	Most are 1 mm to 3 mm in size, 4 cm to 6 cm spaced apart.		Slightly better rock below 17.8 ft, fractured with 2 to 5-inch sized pieces.	Good circulation return, red-brown.
20	20.0		-				
			-			Continued ARGILLITE, purple-gray to brown-gray, moderately to heavily weathered, weak (R2) - poorer zone of rock this run.	
			-	Several healed fractures.			
	Core Run #6-HQ Length 5 ft Recovery 100%	0	-				
			-	Fractures typically 10 to 20°, rough to smooth, undulating to stepped, trace clay infilling in some zones, loose to tight.		Very poor estimated stake durability.	End Box 2 at 23.7 ft. Start Box 3.
25	25.0		-				
			-			Better quality rock below 24.5 ft, still predominantly medium strong (R3), with some weaker broken/fractured zones (like at 26.4 ft and 29.0 ft).	15:07
			-	Healed fractures, some open 1 mm. 26.4 ft, joint, 5°, rough, undulating, infilled with broken and weathered rock (gravel) and clay, open 4 cm spacing.			15:09
	Core Run #7-HQ Length 5 ft Recovery 94%	40	-				
			-	28.1 ft, fracture, 20°, rough, stepped, no infilling, tight (<1 mm).			
30			-				

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
342475.A1.01.T1	I-90 BP-2	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrasture Mitigation — LOCATION : (986523.6 N, 872543.5 E)

ELEVATION : 3238.633 — DRILLING CONTRACTOR : Crux Subsurface (Mike Starling)

DRILLING METHOD AND EQUIPMENT : Burley 4500 Componentized, Core/HWT Casing Advancer

WATER LEVELS : — START : 4/18/2006 — END : 4/18/2006 — LOGGER : J. Butler, P.E.

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	30.0		-	Broken gravelly zone.			
	Core Run #8-HQ Length 5 ft Recovery 100%	24	-	Fractures 31 to 34 ft, curved, steeply inclined (70 to 90°), rough, straight to undulating, tight (typically 0 to 2 mm).		Continued ARGILLITE, purple-gray to purple with green streaks, moderately weathered, medium strong (R3), massive.	Good fluid return, red-brown.
35	35.0		-	34.1 to 34.6 ft, heavily fractured, weathered zone.			15:44
	Core Run #9-HQ Length 4.5 ft Recovery 100%	8	-	Primary fractures spaced 4 to 9 cm, with multiple minor fractures between those at 1 to 2 cm spacing.		Continued ARGILLITE, moderately to highly weathered in zones, finely bedded, not necessarily fractured along bedding planes.	15:46
	39.5		-	Fractures typically 10 to 30° with a few steeper (up to 70°), rough, undulating to stepped, little or no infilling, tight (2 mm).			16:02 backed off
40	Core Run #10-HQ Length 3 ft Recovery 113%	0	-	Discontinuities spaced 4 to 10 cm typical, fractures are typically 1 mm or less (tight), little or no infilling, rough, undulating to stepped.			16:04
	42.5		-				
	Core Run #11-HQ Length 2.5 ft Recovery 92%	0	-			Highly weathered zone from 43 to 45 ft, very fractured and weathered, can be crumbled to 1" minus by hand.	16:26
45	45.0		-				
	Core Run #12-HQ Length 5 ft Recovery 86%	16	-	Fractures, 30 to 60°, rough, stepped, some clay infilling, tight.		Continued ARGILLITE, purple-gray with streaks of orange, green zones, highly weathered and fractures, although still intact.	
			-	Multitude healed fractures, many in this run filled with quartzite, very fine, typically 1 mm or less quartzite veins, some 3 to 4 mm.			
50	50.0		-				16:47
							Entire borehole remained open. Backfilled with bentonite chips.
55							
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	I-SW-1	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Milltown I-90 Inclinometers, I-90 bridges - west bank LOCATION : Bent 2, I-90 EB bridge

ELEVATION : ~ 3264.5 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HWT Casing Advancer/HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 10/25/2006 END : 11/1/2006 LOGGER : G. Fischer

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
						Mud-rotary drilling with HWT casing advancer and tri-cone bit. 140-lb hydraulic trip hammer falling 30 inches. HWT casing 4-inch ID, 4.5-inch OD. Borehole started with CME 45 skid-mount drill rig - slow, difficult drilling through cobbly embankment fill material - switched to CME 850 track-mount drill rig at 6 feet bgs on 10/28/06 HWT casing advanced to refusal at 32 feet bgs - switched to HQ-3 coring on 10/30/06. SS = Split-spoon sampler. PP = Pocket Penetrometer. TSF = tons per square foot. bgs = below ground surface.
5						
6.0						
7.5	0.5	1-SS	16-14-18 (32)		**POORLY-GRADED SAND with GRAVEL (SP).** Brown to red-brown sand with light gray gravel, moist, dense, fine-grained sand, 15 to 25 percent sub-rounded to angular gravel up to 0.5 inch, 10 percent nonplastic silt - (EMBANKMENT FILL).	
10						
10.0						
11.5	0.6	2-SS	13-7-6 (13)		**POORLY-GRADED GRAVEL with SILT and SAND (GP-GM).** Light to dark gray, moist, medium dense, sub-rounded to sub-angular gravel up to 1 inch, 15 to 25 percent coarse-grained sand, 10 percent nonplastic silt - (EMBANKMENT FILL).	
12.5						
14.0	0.5	3-SS	16-9-9 (18)		**POORLY-GRADED GRAVEL (GP).** Light purple and light green, dry, medium dense, sub-rounded gravel up to 1 inch - (EMBANKMENT FILL).	3-SS: 3-inch OD sampler
15						
15.0						
17.0	0.3	4-SS	6-6-7-7 (13)		**POORLY-GRADED GRAVEL (GP).** Similar to 3-SS, with 1.5 inch sub-angular gravel in shoe - (EMBANKMENT FILL).	4-SS: Sampler driven 2.0 feet. Driller notes possibility of driving into soft silt at approximately 17 feet bgs.
18.0						
19.5	0.6	5-SS	10-6-6 (12)		**POORLY-GRADED SAND (SP).** Gray with occasional red-brown grains, wet, medium-dense, fine- to medium-grained sand, less than 5 percent nonplastic silt, organic material (woody debris) in shoe - (SEDIMENT LAYER).	**17.0 feet: Estimated contact with SEDIMENT LAYER.**
20						
20.0						
21.5	0.6	6-SS	5-4-3 (7)		**POORLY-GRADED SAND (SP).** Gray, wet, loose, fine- to medium-grained sand, less than 5 percent nonplastic silt, scattered organic material (woody debris) - (SEDIMENT LAYER).	
25						

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
346017.05.08	I-SW-1 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Milltown I-90 Inclinometers, I-90 bridges - west bank LOCATION : Bent 2, I-90 EB bridge

ELEVATION : ~ 3264.5 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HWT Casing Advancer/HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 10/25/2006 END : 11/1/2006 LOGGER : G. Fischer

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
25.0						
	1.2	7-SS		2-2-2 (4)	**LEAN CLAY (CL).** Dark gray, moist, soft, medium-plastic, slow dilatency reaction. Layer of SILTY SAND (SM) 0.6 to 0.7 feet from top of sample, loose, fine-grained - (SEDIMENT LAYER).	
26.5						Driller notes gravels at 27 to 28 feet. **27.0 feet: Estimated contact with ALLUVIUM LAYER.**
30 30.0						
	0.0	8-SS		40-76-50/3" (126/9")	NO RECOVERY	8-SS: 3-inch OD sampler. Driller thinks sampler was sitting on large cobble based on hard driving and rock fragments recovered in shoe.
31.5						
32.0					Begin Rock Coring at 32.0 ft below ground surface See sheet 3 of 3 for rock core log	Switch to HQ-3 coring - refer to Sheet 3/3.
35						
40						
45						
50						

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	I-SW-1	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Milltown I-90 Inclinometers, I-90 bridges - west bank — LOCATION : Bent 2, I-90 EB bridge

ELEVATION : ~ 3264.5 — DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HWT Casing Advancer/HQ-3 Rock Coring with Wireline

WATER LEVELS : --- — START : 10/25/2006 — END : 11/1/2006 — LOGGER : G. Fischer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
30							
32.0	1-HQ 1 ft 120%	0	NA	2-HQ: NO RECOVERY		Continued ALLUVIUM - **POORLY-GRADED GRAVEL with SAND and COBBLES (GP).** Gray with multi-colored gravels, wet, 70 percent rounded gravels up to 2-inch, 20 percent cobbles greater than 4-inch, 10 percent coarse-grained sand.	Monday, 10/30 08:10 - Start 1-HQ.
33.0	2-HQ 2.5 ft 0%	0					08:30 - 1-HQ blocked off at 33 feet. 08:42 - Start 2-HQ.
35							08:49 - 2-HQ blocked off at 35.5 feet. 08:54 - Start 3-HQ. core ballel mislatched - trip out core barrel.
35.5	3-HQ 5 ft 50%	0	NA			Continued ALLUVIUM - **POORLY-GRADED GRAVEL with SAND and COBBLES (GP).** Predominantly rounded quartzite gravels and cobbles greater than 4-inch with 10 to 20 percent coarse-grained sand.	10:58 - Start 4-HQ. 11:08 - Stop 4-HQ. 11:16 - Start 5-HQ.
40							11:34 - Stop 5-HQ. 11:45 to 12:45 - borehole reamed with HQ-size casing advancer to 48.5 feet.
40.5	4-HQ 3 ft 83%	0	NA >10 >10	40.5 to 43.5 feet: Rubble zone, smooth Argillite fragments, significant clay infilling, highly weathered, open.		**41.0 feet: Contact with weathered ARGILLITE.** Light purple to olive, fine-grained, laminated, extremely weak to very weak (R0-R1). 41.5 to 42.5 feet - Layer of lean CLAY with weathered Argillite fragments, light purple to olive, extremely weak (R0).	Installed 5 10-foot sections of QC-type 2.75-inch OD Slope Indicator inclinometer casing. Annulus space grouted with Slope Indicator's "grout mix for soft soil".
43.5			4			**42.5 feet: Contact with ARGILLITE bedrock.** Purple-gray, fine-grained, very thin bedding, slight to moderate weathering, very weak to weak (R1-R2).	4-inch by 4-inch by 5 foot steel well monument installed over exposed top casing joint on 11/01/06. Top of Casing at approximate Elev. 3267.1 feet, with 2.7 feet of stickup. A0 grove azimuth = 156 degrees.
45	5-HQ 5 ft 86%	16	4 7 3 4	43.5 to 45.5 feet: Multiple fractures in Argillite, 0 to 45 degrees, smooth, undulating, silty clay coating with some 1/8" infilling, slightly to moderately weathered, open becoming tight.		Continued ARGILLITE, less fractured. 45.0 to 45.5 feet: highly fractured, very weak to weak (R1-R2).	
48.5						Bottom of Hole at 48.5 ft below ground surface	
50							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
346017.05.08	I-NW-2 SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Milltown I-90 Inclinometers, I-90 bridges - west bank LOCATION : Bent 2, I-90 WB bridge

ELEVATION : ~ 3264.5 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HWT Casing Advancer/HQ-3 Rock Coring with Wireline

WATER LEVELS : — START : 11/1/2006 END : 11/7/2006 LOGGER : G. Fischer

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
5	7.5					Mud-rotary drilling with HWT casing advancer and tri-cone bit. 140-lb hydraulic trip hammer falling 30 inches. HWT casing 4-inch ID, 4.5-inch OD. HWT casing advanced to refusal at 26.5 feet - switched to HQ coring. SS = 2-inch OD split-spoon sampler PP = Pocket Penetrometer TSF = tons per square foot bgs = below ground surface
	9.0	0.5	1-SS	7-10-9 (19)	**POORLY-GRADED SAND with GRAVEL (SP).** Light brown sand with red-brown gravel, moist, medium-dense, fine-grained sand, 15 to 25 percent sub-rounded to angular gravel up to 1-inch - (EMBANKMENT FILL).	
10	12.5					
	14.0	0.3	2-SS	11-5-3 (8)	**POORLY-GRADED GRAVEL (GP).** Light brown, moist, loose, sub-angular gravel up to 2-inches long (broken gravel/cobble fragments), 10 percent fine to coarse sand - (EMBANKMENT FILL).	2-SS: 2-inch angular gravel (broken gravel/cobble) stuck in tip of shoe. 17:00 - finished for day (11/1/06) at 12.5 feet bgs.
15	15.5	0.0	3-SS	6-6-4 (10)	NO RECOVERY.	07:30 - resuming drilling on 11/2/06 3-SS: 1-inch angular gravel in shoe.
	17.0	0.0	4-SS	12-11-9 (20)	NO RECOVERY.	4-SS: fine-grained sand in shoe. Driller notes hard drilling from 16 to 17 feet bgs.
	18.5	0.0	5-SS	4-5-6 (11)	NO RECOVERY.	5-SS: fine-grained sand in shoe. Driller notes easy drilling starting at 17.0 feet bgs - out of gravels. **17.0 feet - Estimated contact with SEDIMENT LAYER.** SS sampler tripped back down to 17 feet after driving 5-SS - again driven 1.5 feet - recovered 1.0 feet of POORLY-GRADED SAND (SP), fine-grained, loose to medium-dense.
20	22.5					
	24.0	1.4	6-SS	2-1-2 (3)	**POORLY-GRADED SAND (SP).** Brown, wet, loose, fine- to medium-grained sand, 2- to 3-inch thick interlayers of LEAN CLAY - (SEDIMENT LAYER).	6-SS PP on LEAN CLAY: 0.25, 0.50 TSF
25						

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
346017.05.08	I-NW-2 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : Milltown I-90 Inclinometers, I-90 bridges - west bank LOCATION : Bent 2, I-90 WB bridge

ELEVATION : ~ 3264.5 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HWT Casing Advancer/HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 11/1/2006 END : 11/7/2006 LOGGER : G. Fischer

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
25.0	1.0	7-SS	15-13-50/0" (63/6")		Upper 0.2 feet: **POORLY-GRADED SAND (SP).** Similar to 6-SS. Next 0.15 feet: **Interlayered SILT (ML) and LEAN CLAY (CL).** Brown silt and olive clay, moist, soft to firm. Next 0.4 feet: **POORLY-GRADED SAND (SP).** Brown, wet, loose, fine-grained. Bottom 0.25 feet: **POORLY-GRADED GRAVEL (GP).** Gray, wet, very dense. Begin Rock Coring at 26.5 ft below ground surface See sheet 3 of 3 for rock core log	7-SS PP on LEAN CLAY: 0.50, 0.50 TSF Driller notes hard drilling starting at 26 feet bgs - drill chatter observed. **26.0 feet - Estimated contact with ALLUVIUM.** Driller indicated worn HWT casing shoe at 26.5 feet bgs - switch to HQ coring.
26.5						
30						
35						
40						
45						
50						

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	I-NW-2	SHEET 3 OF 3

ROCK CORE LOG

PROJECT : Milltown I-90 Inclinometers, I-90 bridges - west bank — LOCATION : Bent 2, I-90 WB bridge

ELEVATION : ~ 3264.5 — DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HWT Casing Advancer/HQ-3 Rock Coring with Wireline

WATER LEVELS : --- — START : 11/1/2006 — END : 11/7/2006 — LOGGER : G. Fischer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	26.5						
30	1-HQ 3.5 ft 71% / 30.0	0	NA			Continued ALLUVIUM - **WELL-GRADED GRAVEL with COBBLES,** light gray to red-brown, wet, 60 percent fine (less than 3/4-inch) to coarse (less than 3-inch) rounded to sub-rounded gravel, 40 percent cobbles up to 8-inch.	12:00 on 11/2/06 - start 1-HQ
	2-HQ 2.5 ft 60% / 32.5	0	NA			**WELL-GRADED GRAVEL with COBBLES,** light gray to red-brown, wet, 60 percent fine (less than 3/4-inch) to coarse (less than 3-inch) rounded to sub-rounded gravel, 40 percent cobbles up to 8-inch.	12:10 - end 1-HQ 12:22 - start 2-HQ
	3-HQ 1.5 ft 100% / 34.0	0	NA			32.5 to 33.3 feet: **POORLY-GRADED GRAVEL**up to 3/4-inch, multiple colors, sub-rounded.	12:27 - end 2-HQ 12:34 - start 3-HQ
35	4-HQ 1 ft 100% / 35.0	0	NA			33.3 to 35.0 feet: COBBLES up to 8-inch.	12:39 - end 3-HQ 12:45 - start 4-HQ
	5-HQ 3.2 ft 63% / 38.2	0	NA			**POORLY-GRADED GRAVEL**with fractured Argillite cobble fragments, rounded gravel up to 3/4-inch.	12:50 - end 4-HQ 12:56 - start 5-HQ 13:08 - end 5-HQ 13:25 - end 6-HQ 13:28 - start 7-HQ 13:34 - end 7-HQ
40	6-HQ 1.8 ft 56% / 40.0	0	NA			Continued ALLUVIUM - **WELL-GRADED GRAVEL,**light gray to red-brown, wet, fine to coarse sub-rounded to sub-angular gravel.	
	7-HQ 2 ft 50% / 42.0	0	NA			**POORLY-GRADED GRAVEL**with coarse sand, light gray to red-brown, wet, rounded to sub-angular gravel up to 1 1/2-inch.	13:52 - end 8-HQ 14:10 - end 9-HQ - finished for day (11/2/06) at 15:00. 11/7/06: 08:30 to 10:00 - borehole reamed with HQ-size casing advancer to 50 feet. Installed 5 10-foot sections of QC-type 2.75-inch OD Slope Indicator inclinometer casing. Annulus space grouted with Slope Indicator's "grout mix for soft soil". 4-inch x 4-inch x 5-foot steel well monument installed over exposed casing joint. Top of Casing at approximate Elev. 3267.1 feet, with 2.6 feet of stickup. A0 grove azimuth = 170 degrees.
45	8-HQ 3 ft 100% / 45.0	0	NA 6 7	43.5 to 43.6 feet: highly weathered, fractured zone. 44.5 feet: fracture 5 to 30 degrees, smooth, undulating, clay and coarse sand infilling 1/2-inch thick, moderately weathered, loose.		42.0 to 42.7 feet: **POORLY-GRADED GRAVEL**with cobble fragment. **42.7 feet: Contact with ARGILLITE bedrock,** light purple, smooth, moderately weathered at contact becoming slightly weathered with depth, laminated becoming thinly bedded, very weak to medium-strong (R1-R3).	
	9-HQ 5 ft 96%	0	3 10 5 5 5	46.1 feet: fracture 30 to 40 degrees, smooth, undulating, clay infilling 1/4-inch thick, slightly weathered, tight. 48.1 to 48.6 feet: multiple fractures 30 degrees, smooth, undulating, clay infilling 1/16-inch thick, slightly weathered, tight. 49.2 to 49.4 feet: highly fractured/rubble zone, smooth to rough, clay coating with some 1/16-inch thick infilling, slightly weathered, open.		Continued **ARGILLITE,** light purple, smooth, slightly weathered, thinly bedded with 20 to 30 degree dipping,very weak to medium-strong (R1-R3).	
50	50.0						

Bottom of Hole at 50.0 ft below ground surface

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-1/N-5	SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE CornerLOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 11/8/2006 END : 11/8/2006 LOGGER : G. Fischer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
0	0.0			Jet Grout Test Column profile: 0.0 to 1.0 feet: strong grout (R1). 1.0 to 1.2 feet: rubble zone, (R0). 1.2 to 2.6 feet: strong grout (R1). 2.6 to 3.1 feet: cobble 3.1 to 3.5 feet: strong grout (R1). 3.5 to 3.7 feet: very weak grout (R0). 3.7 to 4.0 feet: cobble		Upper 0.6 feet: Coarse SAND and fine GRAVEL in grout matrix, cemented/strong grout - (EMBANKMENT FILL). At 0.6 feet: Coarse GRAVELS and COBBLES in grout matrix, 10 to 20 percent fine (less than 3/4-inch) gravel, 20 to 30 percent coarse (up to 3-inch) gravel, and 50 percent cobbles up to 6-inch, cemented/weak to strong grout.	HQ-size coring starting at top of jet grout test column. PP = Pocket Penetrometer. TSF = tons per square foot. 09:10 - start 1-HQ. 09:30 - stop 1-HQ. 09:30 to 10:15 - set up "mud tub" to recirculate drilling fluids.
	1-HQ 4.5 ft 100%	0	NA				
	4.5						
5				4.0 to 5.3 feet: strong grout (R1). 5.3 to 7.1 feet: very weak grout (R0). PP = 0.5, 1.0, > 5.0 TSF 7.1 to 9.0 feet: strong grout (R1). 9.0 to 9.5 feet: NO RECOVERY.		**5.3 feet: Contact.** Layer of SILTY SAND/SANDY SILT, dark gray, 40 to 60 percent fine sand, weakly cemented with grout odor, scattered organic material (woody debris). **7.1 feet: Contact.** Coarse GRAVEL and COBBLES in grout matrix, 50 percent gravel up to 3-inch, 50 percent cobbles up to 6-inch, cemented/weak to strong grout - (EMBANKMENT FILL).	10:15 - start 2-HQ.
	2-HQ 5 ft 90%	0	NA				
	9.5			**9.5 to 10.5 feet: strong grout (R1). potential test specimen.** 10.5 to 11.2 feet: cobbles. 11.2 to 12.7 feet: very weak grout (R0) with fragments of strong grout (R1).			10:23 - stop 2-HQ. 10:30 - start 3-HQ. End Box 1 at 9.5 feet. Start Box 2.
10				12.7 to 14.2 feet: strong grout (R1). PP = greater than 5.0 TSF. **13.1 to 14.2 feet: potential test specimen.**			**Test specimen from 9.6 to 10.0 feet: qu = 810.2 psi.**
	3-HQ 5 ft 100%	0	NA	14.2 to 15.3 feet: strong grout (R1). PP = greater than 5.0 TSF. **15.3 to 17.1 feet: strong grout (R1), potential test specimen.** 17.1 to 18.3 feet: weak grout (R0). **17.1 to 17.7 feet: potential test specimen.**			
	14.5			**18.3 to 19.4 feet: strong grout (R1), potential test specimen.**		**14.2 feet: Contact with SEDIMENT LAYER.** SILTY SAND in grout matrix, dark gray, fine-grained sand with occasional organic material (woody debris), occasional voids up to 1/4-inch, cemented/strong grout.	10:44 - start 4-HQ. **Test specimen from 15.7 to 16.1 feet: qu = 214.9 psi.** **Test specimen from 16.1 to 16.5 feet: qu = 342.1 psi.** End Box 2 at 17.1 feet. Start Box 3. **Test specimen from 18.9 to 19.3 feet: qu = 688.9 psi.**
15				19.4 to 21.1 feet: very weak to weak grout (R0). 19.5 feet: PP = 1.75 TSF. 19.7 feet: PP = 4.0 TSF. 19.8 feet: PP = greater than 5.0 TSF. 20.0 feet: PP = 2.0 TSF. 20.2 feet: PP = 2.5 TSF. 20.5 feet: PP = greater than 5.0 TSF. **20.7 to 21.1 feet: potential test specimen.**			
	4-HQ 5 ft 100%	0	NA				
	19.5			21.1 to 23.1 feet: very weak grout (R0). 21.3 feet - SILTY CLAY layer with trace grout. 22.1 feet: PP = 0.75 TSF. 22.2 feet: PP = 0.5 TSF. 22.5 feet: PP = 0.25 TSF. 22.6 feet: PP = 0.25 TSF. 22.8 to 23.0 feet: PP = 1.0 - 2.0 TSF.		Fine-grained SAND to SILTY SAND in grout matrix, dark brown to olive, 5 to 10 percent coarse sand and fine gravel, cemented/weak to strong grout. 21.3 to 23.1 feet: SILTY CLAY, olive, soft, low plasticity, very weakly cemented with grout odor. 23.1 to 26.7 feet: POORLY-GRADED SAND in grout matrix, dark dray, fine-grained, cemented/strong grout.	10:52 - stop 4-HQ. 11:04 - start 5-HQ.
20							
	5-HQ 5 ft 94%	0	NA	23.1 to 24.5 feet: weak to strong grout (R0-R1) 23.4 to 23.7 feet: PP = 4.0 to 5.0 TSF 23.9 feet: PP = 2.5 TSF 24.0 feet: PP = greater than 5.0 TSF			
	24.5						
25							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-1/N-5	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE CornerLOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 11/8/2006 END : 11/8/2006 LOGGER : G. Fischer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	6-HQ 5 ft 100%	0	NA	24.5 to 26.7 feet: strong grout (R1). 24.5 to 25.2 feet: PP = greater than 5.0 TSF. **25.2 to 26.7 feet: potential test specimen.**		**26.7 feet: Contact with ALLUVIUM.** Coarse GRAVEL and COBBLES in grout matrix, cemented/strong grout.	**Test specimen from 25.1 to 25.5 feet: qu = 209.8 psi.** **Test specimen from 25.5 to 25.9 feet: qu = 318.3 psi.** End Box 3 at 27.0 feet. Start Box 4.
29.5				26.7 to 27.2 feet: cobble 27.2 to 29.1 feet: weak to strong grout (R0-R1). **28.6 to 29.1 feet: potential test specimen.** 29.1 to 29.3 feet: cobble 29.3 to 31.9 feet: strong grout (R1). **29.5 to 30.7 feet: potential test specimen.**			
30	7-HQ 5 ft 100%	0	NA	30.7 to 31.4 feet: cobble. **31.4 to 31.9 feet: potential test specimen.** 31.9 to 32.4 feet: very weak grout (R0), crumbles upon handling. 32.4 to 32.7 feet: cobble.		Fine to coarse GRAVEL and COBBLES in grout matrix, cemented/strong grout. 31.9 to 32.4 feet: SILTY CLAY with coarse SAND and fine GRAVEL in grout matrix, weakly cemented. 32.4 feet: COBBLE 32.7 to 35.1 feet: Fine to coarse GRAVEL and COBBLES in grout matrix, 30 to 40 percent grout, cemented/strong grout.	**Test specimen from 29.8 to 30.3 feet: qu = 673.6 psi.** **Test specimen from 30.3 to 30.7 feet: qu = 636.9 psi.** **Test specimen from 30.7 to 31.1 feet: qu = 2039.8 psi.**
34.5				32.7 to 35.1 feet: strong grout (R1) with some washing of grout during coring. 35.1 to 36.3 feet: non-cemented (R0) with some residual grout.			
35	8-HQ 2.5 ft 88%	0	NA	36.3 to 36.7 feet: cobble. 36.7 to 37.4 feet: non-cemented (R0) with grout odor. 37.4 to 38.4 feet: strong grout (R1). **37.4 to 38.0 feet: potential test specimen.**		35.1 to 37.4 feet: Coarse GRAVEL and COBBLE fragments with some residual grout, non-cemented, grout odor.	End Box 4 at 34.8 feet. Start Box 5.
37.0				38.4 to 40.5 feet: weak to strong grout (R0-R1) with zones of non-cemented gravels.		Continued ALLUVIUM - 37.4 to 42.5 feet: Fine GRAVEL and coarse SAND in grout matrix, cemented/weak to strong grout, occasional non-cemented rubble zones with trace grout.	
	9-HQ 2.5 ft 96%	0	NA	40.5 to 41.2 feet: strong grout (R1), potential test specimen. 41.2 to 41.5 feet: non-cemented (R0) with grout odor.			
39.5							
40	10-HQ 3 ft 67%	0	NA	41.5 to 42.5 feet: NO RECOVERY. 42.5 to 43.2 feet: non-cemented (R0) with grout odor.			
42.5				43.2 to 44.5 feet: Multiple fractures in Argillite, weathering decreasing with depth, 0 to 45 degrees, smooth, undulating, silty clay infilling, open becoming tight.		42.5 to 43.2 feet: Coarse GRAVEL and COBBLES with some residual grout, non-cemented with grout odor. 43.2 to 43.8 feet: weathered ARGILLITE, extremely weak (R0). **43.8 feet - Contact with ARGILLITE Bedrock.** ARGILLITE, light purple, fine-grained, slight to moderate weathering, laminated, very weak to weak (R1-R2), highly fractured, bedding dips 20 degrees.	12:20 - stop 11-HQ. End Box 5 at 44.5 feet. Borehole backfilled with grout to near ground surface.
	11-HQ 2 ft 100%	0	NA > 10				
44.5						Bottom of Hole at 44.5 ft below ground surface	
45							
50							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-4/F-61	SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE CornerLOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 10/27/2006 END : 10/28/2006 LOGGER : G. Warren

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	0.0			Jet Grout Test Column profile:		0.0 to 2.0 feet: Loose, rubbly 1-inch minus rounded GRAVEL with broken/fractured grout pieces - (EMBANKMENT FILL).	HQ-size coring starting at top of jet grout column.
	1-HQ 5 ft 80%	0	NA	0.0 to 2.2 feet: rubble zone, loose/non-cemented with grout remnants. 2.2 to 5.0 feet: strong grout (R1). 4.0 feet: cobble		2.0 to 5.0 feet: Intact grouted GRAVEL with occasional purple quartzite cobbles, approximately 50 percent 1 to 2-inch clasts, 50 percent grout matrix, cemented/strong grout (R1).	SS = Split-Spoon Sampler WOH = Weight of Hammer PP = Pocket Penetrometer. TSF = tons per square feet. bgs = below ground surface. Begin coring with HQ-size core at 14:30.
5	5.0						Core to 5 feet bgs. Run HWT casing to 5 feet bgs, then set up recirculation tanks or "mud tubs".
	2-HQ 2 ft 100%	0	NA	5.0 to 10.0 feet: rubble zone, loose/non-cemented with grout remnants.		Loose fine to coarse GRAVEL up to 2-inch in broken up/fractured and discontinuous grout matrix, non-cemented with grout remnants - (EMBANKMENT FILL).	15:20 - resume coring/start 2-HQ.
	7.0						Blocked off at 7 feet bgs.
	3-HQ 3 ft 83%	0	NA				
10	10.0						
	4-HQ 1 ft 100%	0	NA	10.0 to 11.0 feet: strong grout (R1).		Coarse GRAVEL in grout matrix, 50 to 60 percent gravel, 40 to 50 percent grout, cemented/strong grout - (EMBANKMENT FILL).	
	11.0						Blocked off at 11 feet bgs.
	5-HQ 1.5 ft 83%	0	NA	11.0 to 12.5 feet: strong grout (R1) deteriorates with depth to very poor/non-cemented - grout odor only at bottom of interval (near contact with SEDIMENT LAYER).		Loose, coarse GRAVEL up to 3-inch, rounded gravel, non-cemented, grout odor - (EMBANKMENT FILL).	
	12.5						Blocked off at 12.5 feet bgs.
	6-HQ 2.5 ft 0%	0		12.5 to 15 feet: NO RECOVERY		NO RECOVERY **12.5 feet: Estimated contact with SEDIMENT LAYER.**	Fast drilling from 12.5 to 15.0 feet.
15	15.0						
	7-HQ 5 ft 0%	0		15.0 to 20.0 feet: NO RECOVERY - appears to be loose, non-cemented sediment with no evidence of grout.		NO RECOVERY	Very fast drilling in loose sediments. 15.0 to 20.0 feet - cuttings of brown fine-grained sand.
20	20.0						8-SS at 20.0 feet: attempt SPT sample.
	8-SS 1.5 ft 0%	0		20.0 to 26.0 feet: Non-cemented sediments with no evidence of grout.		SILTY CLAY (ML-CL), dark gray to black, moist, firm - (SEDIMENT LAYER).	Blow count of 1 - 2- 3 (5). No recovery due to lack of check valve (sample fell out).
	21.5					23.0 to 23.7 feet: SILTY CLAY (ML-CL), dark gray, moist, stiff, low-plasticity.	No grout odor on sediment smeared on outside of SS sampler.
	22.5					23.7 to 24.5 feet: transition to POORLY-GRADED SAND (SP), gray, moist, medium-dense, fine-grained.	9-SS at 22.5 feet: 2-foot-long SS sampler.
	9-SS 2 ft 100%	0	NA				Blow count of WOH-3-5-7 (12).
	24.5					Dark gray organic LEAN CLAY seam at 24 feet.	
25							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-4/F-61	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE CornerLOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 10/27/2006 END : 10/28/2006 LOGGER : G. Warren

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	10-HQ 3 ft 50%	0	NA	26.0 to 28.0 feet: rubble zone, loose/non-cemented with no evidence of grout in ALLUVIUM.		**26.0 feet: Contact with ALLUVIUM.** Red Quartzite COBBLES in SANDY FINE GRAVEL matrix, non-cemented, no evidence of grout.	Blocked off at 27.5 feet. Blocked off at 28.0 feet. Casing shoe torn up - terminate boring at 28 feet bgs.
27.5							
28.0	11-HQ 0.5 ft 100%	0	NA			Bottom of Hole at 28.0 ft below ground surface	Borehole backfilled with grout to near ground surface.
30							
35							
40							
45							
50							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-5/F-59	SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE Corner LOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 11/1/2006 END : 11/1/2006 LOGGER : G. Fischer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
0.0				Jet Grout Test Column profile:		0.0 to 2.5 feet: SAND in grout matrix, predominantly fine-grained sand with 10 percent coarse-grained sand and approximately 50 percent grout, cemented/strong grout - (EMBANKMENT FILL). Fine gravels (less than 3/4-inch) starting at 1.8 feet bgs. 2.5 to 5.0 feet: Coarse GRAVEL with COBBLES in grout matrix, 10 percent coarse sand, loose/non-cemented from 2 to 3 feet, weakly cemented from 3 to 4 feet, cemented/strong grout from 4 to 5 feet.	09:00 - start setup HQ-size coring started at top of jet grout test column. PP = Pocket Penetrometer. TSF = tons per square foot. 09:55 - start 1-HQ.
	1-HQ 5 ft 100%	0	NA	0.0 to 2.5 feet: strong grout (R1). 2.7 feet: cobble. 2.8 to 3.0 feet: loose rubble zone with grout remnants. 3.0 to 4.0 feet: very weak grout (R0). 4.0 to 5.0 feet: strong grout (R1).			
5 5.0				5.0 to 5.2 feet: loose rubble zone with grout remnants. 5.2 to 7.1 feet: weak to strong grout (R0-R1). 5.5, 7.0 feet: cobbles. 7.1 to 7.8 feet: very weak grout (R0). 7.8 to 9.1 feet: weak to strong grout (R0-R1). 9.1 to 9.3 feet: very weak grout (R0). 9.3 to 10.0 feet: weak grout (R0) with several mechanical breaks.		Continued coarse GRAVEL with COBBLES in grout matrix, cemented/weak to strong grout - (EMBANKMENT FILL).	10:05 - end 1-HQ. 10:12 - start 2-HQ. 10:20 to 10:50 - set up recirculation tanks.
	2-HQ 4.3 ft 98%	0	NA				
9.3							End Box 1 at 9.3 feet. Start Box 2.
10 10.0	3-HQ 0.7 ft 86%	0	NA	10.0 to 10.5 feet: loose rubble zone with grout remnants. 10.5 to 12.0 feet: weak grout (R0) with some washing out of grout during coring. 11.8 feet: cobble. 12.0 to 12.2 feet: loose rubble zone with grout remnants. 12.2 to 15.0 feet: weak grout (R0) with some washing out of grout during coring.		Fine to coarse GRAVEL in grout matrix, cemented/strong grout - (EMBANKMENT FILL).	10:58 - end 2-HQ. blocked off at 9.3 feet. 11:02 - start 3-HQ. 11:04 - end 3-HQ. 11:10 - start 4-HQ.
	4-HQ 5 ft 100%	0	NA				
15 15.0				15.0 to 17.0 feet: weak to strong grout (R0-R1). 16.5 feet: cemented coarse sand lense. 17.0 to 18.2 feet: strong grouted pieces up to 3-inch long. 18.2 to 20.0 feet: NO RECOVERY		15.0 to 17.0 feet: GRAVEL with COBBLES in grout matrix, cobbles up to 6-inch, cemented/strong grout. **17.0 feet: Contact with SEDIMENT LAYER.** POORLY-GRADED SAND in grout matrix, fine-grained sand, occasional organic material (woody debris) and fine gravel in matrix, cemented pieces up to 3-inch long.	11:18 - end 4-HQ. 11:22 - start 5-HQ. Driller notes easy drilling in zones from 17 to 19 feet, and from 19 to 20 feet.
	5-HQ 5 ft 64%	0	NA				
20 20.0				20.0 to 22.5 feet: non-cemented loose silty sand with grout odor. 22.5 to 25.0 feet: NO RECOVERY		POORLY-GRADED SAND with thin layers of interbedded LEAN CLAY, dark gray to olive, fine grained, non-cemented with grout remnants and grout odor - (SEDIMENT LAYER).	End Box 2 at 20.0 feet. Start Box 3. 11:28 - end 5-HQ. 11:38 - start 6-HQ. Driller notes some resistance to coring for 2/3 of 6-HQ run, and no resistance for 1/3 of run.
	6-HQ 5 ft 50%	0	NA				
25							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
346017.05.08	T-5/F-59 SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE Corner LOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 11/1/2006 END : 11/1/2006 LOGGER : G. Fischer

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	25.0			25.0 to 26.7 feet: non-cemented loose silty sand with grout odor. PP = less than 0.5 TSF. 26.7 to 27.3 feet: loose rubble zone with grout remnants. 27.3 to 28.0 feet: NO RECOVERY.		25.0 to 26.7 feet: POORLY-GRADED SAND, fine-grained, non-cemented with grout odor. **26.7 feet: Contact with ALLUVIUM.** Coarse GRAVEL with SAND, loose, non-cemented with grout remnants.	11:44 - end 6-HQ.
	7-HQ 3 ft 77%	0	NA				
	28.0			28.0 to 29.5 feet: loose rubble zone with trace grout. 29.5 to 30.0 feet: NO RECOVERY.		Coarse GRAVEL with COBBLES, rounded to subrounded gravel up to 3-inch and cobbles up to 6-inch, loose, non-cemented with grout remnants.	
	8-HQ 2 ft 75%	0	NA				
30	30.0			30.0 to 32.0 feet: loose rubble zone with trace grout. 32.0 to 32.5 feet: NO RECOVERY. 32.5 to 33.5 feet: loose rubble zone with trace grout.		Coarse GRAVEL with COBBLES, rounded to subrounded gravel up to 3-inch and cobbles up to 6-inch, loose, non-cemented with grout remnants.	
	9-HQ 2.5 ft 80%	0	NA				
	32.5					32.5 to 33.5 feet: Continued coarse GRAVEL with COBBLES, loose, non-cemented. **33.5 feet: Contact with weathered ARGILLITE.**	
	10-HQ 2.5 ft 100%	0	NA / > 10	33.5 to 35.0 feet: ARGILLITE bedrock, no grout.		**33.8 feet: Contact with ARGILLITE bedrock.** Light purple, fine-grained, slightly weathered, very weak (R1), laminated and highly fractured.	12:15 - end 10-HQ. End Box 3 at 35.0 feet.
35	35.0					Bottom of Hole at 35.0 ft below ground surface	Borehole backfilled with grout to near ground surface.
40							
45							
50							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-6/F-57	SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE Corner LOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 10/27/2006 END : 10/27/2006 LOGGER : G. Warren

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
0	0.0			Jet Grout Test Column profile:		0.0 to 1.5 feet: Fine GRAVEL with SAND in grout matrix, 10 to 20 percent fine (less than 3/4-inch) gravel, coarse sand, greater than 50 percent grout, cemented/strong grout - (EMBANKMENT FILL).	09:00 - start setup. HQ-size coring started at top of jet grout test column. PP = Pocket Penetrometer. TSF = tons per square foot. bgs = below ground surface.
	1-HQ 5 ft 100%	0	NA	0.0 to 1.5 feet: strong grout (R1). 1.5 to 3.0 feet: loose rubble zone with grout remnants. 3.0 to 4.0 feet: weak grout (R0). **4.0 to 5.0 feet: strong grout (R1), potential test specimen.**		1.5 to 3.0 feet: Coarse GRAVEL in sand and grout matrix, 50 to 60 percent gravel from 1 to 3-inch, weakly cemented.	09:00 - start 1-HQ. 10:00 - end 1-HQ.
5	5.0					3.0 to 5.0 feet: Coarse GRAVEL with COBBLES in grout matrix, 50 percent ARGILLITE clasts, cemented/weak becoming strong grout from 4 to 5 feet.	10:00 to 10:40 - set HWT casing to 5 feet bgs and set up recirculation tanks.
	2-HQ 1 ft 100%	0	NA	5.0 to 6.0 feet: loose rubble zone with grout remnants.		5.0 to 10.4 feet: Coarse GRAVEL with COBBLES in grout matrix, 50 percent gravel from 1 to 3 inch, cemented/very weak to strong grout.	10:45 - end 2-HQ. blocked off at 6.0 feet.
	6.0			6.0 to 7.5 feet: weak grout (R0), potential washing out of grout during coring.			10:50 - start 3-HQ.
	3-HQ 1.5 ft 87%	0	NA	7.5 to 8.0 feet: loose rubble zone with grout remnants.			10:53 - end 3-HQ. blocked off at 7.5 feet.
	7.5			8.0 to 10.4 feet: strong grout (R1) **8.0 to 9.1 feet: potential test specimen.** **9.1 to 9.7 feet: potential test specimen.**			
	4-HQ 2.5 ft 92%	0	NA				10:58 - start 4-HQ. **Test specimen from 8.4 to 8.8 feet: qu = 685.2 psi.**
10	10.0						
	5-HQ 1.5 ft 113%	0	NA	10.4 to 11.3 feet: strong grout (R1). 11.3 to 12.5 feet: weak grout (R0). 12.5 to 14.0 feet: loose rubble zone/non-cemented. 14.0 to 15.0 feet: NO RECOVERY.		10.4 to 10.7 feet: SILTY CLAY (ML-CL), red-gray. 10.7 to 11.3 feet: Coarse GRAVEL and COBBLES in grout matrix, cemented/strong grout becoming very weak at 11.3 feet.	11:02 - end 4-HQ. 11:09 - start 5-HQ. blocked off at 11.5 feet.
	11.5						End Box 1 at 10.0 feet. Start Box 2.
	6-HQ 1.5 ft 100%	0	NA			11.3 to 12.0 feet: Coarse GRAVEL with COBBLES, non-cemented with grout remnants.	
	13.0					12.0 to 12.5 feet: Coarse GRAVEL with COBBLES in grout matrix, cemented.	11:25 - end 6-HQ. blocked off at 13.0 feet.
	13.5 7-HQ 0.5 ft 0%	0	NA			12.5 to 15.0 feet: Coarse GRAVEL with COBBLES, non-cemented with grout remnants - (EMBANKMENT FILL).	11:35 - start 7-HQ. 11:37 - end 7-HQ. blocked off at 13.5 feet.
	14.5 8-HQ	0		15.0 to 16.0 feet: loose rubble zone/non-cemented with grout remnants.			11:44 - start 8-HQ.
15	15.0 1 ft 50%	0		16.0 to 16.5 feet: cobble.		15.0 to 16.5 feet: Coarse GRAVEL with COBBLES, non-cemented with grout remnants.	11:53 - start 9-HQ.
	9-HQ 0.5 ft 0%	0	NA	16.5 to 17.5 feet: very weak to weak grout (R0). PP = greater than 5.0 TSF. **17.5 to 18.3 feet: strong grout, potential test specimen.**		**16.5 feet - Contact with SEDIMENT LAYER.**	**Test specimen from 17.6 to 18.1 feet: qu = 215.6 psi.**
	17.0 10-HQ 2 ft 75%	0	NA	18.3 to 21.0 feet: overal weak grout with strong grout pieces. 19.3 feet: PP = greater than 5.0 TSF. 20.1 feet: PP = greater than 5.0 TSF. 20.4 feet: PP = greater than 5.0 TSF.		16.5 to 17.0 feet: SILTY SAND with GRAVEL in grout matrix, fine-grained sand with fine gravel, weakly cemented/crumbles upon handling.	
	11-HQ 1.5 ft 113%	0	NA			17.0 to 25.0 feet: Interbedded SILTY SAND and POORLY-GRADED SAND, dark gray to dark brown, fine-grained sand, cemented/very weak to strong grout - (SEDIMENT LAYER).	
	18.5 12-HQ 1.5 ft 67%	0	NA				
20	20.0			21.0 to 25.0 feet: very weak to strong grout, minor washout zones, variable strength throughout. 21.1 feet: PP = 5.0 TSF. 21.4 feet: PP = 5.0 TSF. **21.6 to 22.2 feet: potential test specimen.** 22.4 feet: PP = 5.0 TSF. 22.6 feet: PP = greater than 5.0 TSF. 22.8 feet: PP = greater than 5.0 TSF. 23.2 feet: PP = 3.5 TSF. 23.5 feet: PP = greater than 5.0 TSF. 23.6 feet: PP = 4.0 TSF.			End Box 2 at 21.0 feet. Start Box 3. **Test specimen from 21.6 to 22.1 feet: qu = 33.7 psi.**
	13-HQ 5 ft 68%	0	NA				
25							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	T-6/F-57	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West Bank - NE CornerLOCATION : Jet grout test column in NE corner, west bank.

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Ruen Drilling, Inc./Clark Fork, ID

DRILLING METHOD AND EQUIPMENT : CME 850 track-mount, HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 10/27/2006 END : 10/27/2006 LOGGER : G. Warren

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	25.0			25.0 to 26.8 feet: strong grout.		Continued SILTY SAND, dark gray to brown, fine-grained, cemented/strong grout.	**Test specimen from 25.5 to 26.0 feet: qu = 174.3 feet.**
	14-HQ 3.5 ft 89%	0	NA	25.3 feet: PP = greater than 5.0 TSF. **25.5 to 26.2 feet: potential test specimen.** 26.5 feet: PP = greater than 5.0 TSF. 26.7 feet: PP = greater than 5.0 TSF. 26.8 to 27.3 feet: very weak grout. 27.1 feet: PP = 0.50, 0.75 TSF.		26.8 to 27.3 feet: POORLY-GRADED SAND, dark gray, non-cemented with grout odor. **27.3 feet: Contact with ALLUVIUM.** POORLY-GRADED GRAVEL, rounded up to 3-inch, loose and non-cemented.	
	28.5			27.3 to 28.5 feet: loose rubble zone/non-cemented with trace grout.		Coarse GRAVEL with COBBLES up to 6-inch in minor sandy matrix, loose and non-cemented with occasional grout infilling/remnants.	Lost circulation.
	15-HQ 1.5 ft 100%	0	NA	28.5 to 30.8 feet: occasional grouted piece (R0)/non-cemented.		Coarse GRAVEL, non-cemented with occasional grout remnants. 30.8 to 31.2 feet: layer of weakly cemented gravel.	
30	30.0			30.8 to 31.2 feet: very weak grout (R0).		Coarse GRAVEL with COBBLES, multi-colored, mixed lithology, loose and non-cemented with grout remnants.	End Box 3 at 33.6 feet.
	16-HQ 2 ft 75%	0	NA	31.2 to 34.0 feet: loose rubble zone with trace grout.		**34.0 feet: Contact with ARGILLITE bedrock.** ARGILLITE, reddish-purple, fine-grained, slightly weathered, weak (R2), thinly bedded with bedding dips of 30 degrees.	Borehole backfilled with grout to near ground surface.
	32.0					Bottom of Hole at 35.0 ft below ground surface	
	17-HQ 3 ft 100%	0	NA				
			> 10	34.0 to 35.0 feet: ARGILLITE bedrock, no grout.			
35	35.0						
40							
45							
50							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
346017.05.08	Test Column #7 SHEET 1 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West bank of Blackfoot River LOCATION : Jet grout test column in SE corner, west bank

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Crux Subsurface/Spokane, WA

DRILLING METHOD AND EQUIPMENT : HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 9/30/2006 END : 9/30/2006 LOGGER : D. Harris

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
0	0.0			Intact core at center - rind of disturbed material around outside.		0.0 to 2.0 feet: SAND with gravel, medium gravel - (EMBANKMENT FILL). 2.0 to 5.0 feet: SAND with gravel, large gravel - (EMBANKMENT FILL).	08:15 - start 1-HQ
	1-HQ 5 ft 100%	0		1.8 to 4.0 feet: very gravelly, little intact material - poor cementation.			
				well cemented			
5	5.0		0	Grouted gravelly and cobbly fill.		Cemented GRAVELS and COBBLES - (EMBANKMENT FILL).	08:25 - start 2-HQ. Stopped coring because of water. Core was intact when first removed, but fractured along large cobbles.
			0				
	2-HQ 5 ft 100%	0	1				
			2				
			3				
10	10.0						09:20 - start 3-HQ. 09:35 - blocked off at 13.5 feet.
	3-HQ 3.5 ft 100%	0		11.3 feet: large gravel 12.2 feet: lots of gravel in cemented matrix, but wash material around outside - appears that this material is cemented, but fractured from coring action.			
	13.5					GRAVEL with SAND and COBBLES - (EMBANKMENT FILL).	
	4-HQ 1.5 ft 100%	0		13.5 feet: well cemented			
15	15.0						09:40 - stop 4-HQ.
				15.0 to 16.7 feet: cemented - large gravels.		15.0 to 16.5 feet: GRAVEL with SAND and COBBLES. 16.5 to 17.5 feet: SILTY SAND to SANDY SILT. ORGANIC CLAY at 17.7 feet.	Driller noted softening at 16 feet for couple of inches.
	5-HQ 5 ft 100%	0		16.7 to 17.5 feet: cemented, except for two zones, each 2 to 3 inches thick.		18.0 to 21.0 feet: GRAVEL with SAND - (EMBANKMENT FILL).	17.7 feet - possible Qu sample.
				generally well cemented			
20	20.0						19.5 to 20.0 feet - possible Qu sample.
						21.0 feet: Contact with SEDIMENT LAYER. SILTY CLAY (CL-ML).	Driller noted heave.
	6-HQ 5 ft 100%	0		22.6 to 23.7 feet: poor cementation - mixing zone has cemented clasts but overall is poorly cemented.			22.0 feet - possible Qu sample. Zone has cement odor.
25							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
346017.05.08	Test Column #7	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : Milltown Bridge Infrastructure Mitigation, West bank of Blackfoot River LOCATION : Jet grout test column in SE corner, west bank

ELEVATION : ~ 3264 DRILLING CONTRACTOR : Crux Subsurface/Spokane, WA

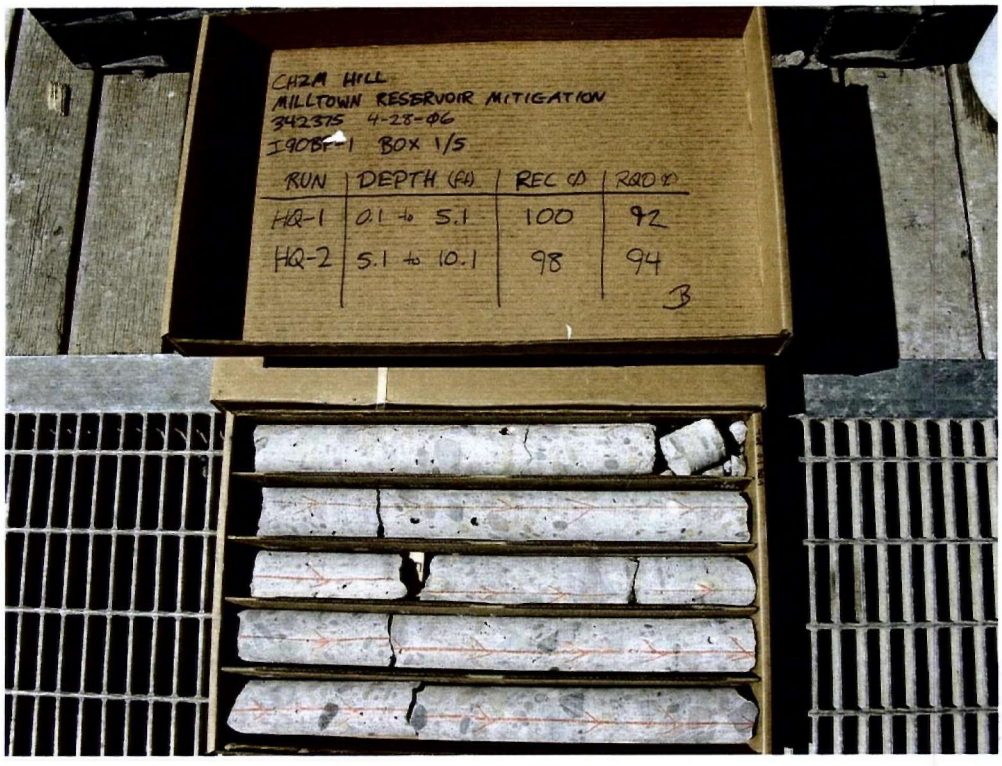
DRILLING METHOD AND EQUIPMENT : HQ-3 Rock Coring with Wireline

WATER LEVELS : --- START : 9/30/2006 END : 9/30/2006 LOGGER : D. Harris

DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	GRAPHIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	25.0			2.5 feet of heave.		Continued SEDIMENTS **29.5 feet: Contact with ALLUVIUM.** COBBLES in SAND and GRAVEL matrix.	Driller repairs. 10:11 - start 7-HQ. Driller noted 2.5 feet of heave.
	7-HQ 5 ft 100%	0		27.5 to 28.0 feet: well cemented. 28.0 to 29.0 feet: approx 2 to 3 inch zones of partially cemented. 29.0 to 30.0 feet: well cemented.			
30	30.0			cobbles - very little cemented matrix because of large cobbles (6 to 9 inch).			
	8-HQ 5 ft 100%	0		some cemented matrix material (approx 2 to 3 inches).			
				33.8 feet: interface with rock.			
35	35.0			ARGILLITE		**33.8 feet: Contact with ARGILLITE bedrock.**	
	9-HQ 5 ft 100%	0	> 10 2 - 3 2 - 3 > 10 > 10				
40	40.0					Continued ARGILLITE.	
	10-HQ 3 ft 100%	0					12:15 - stop 10-HQ.
	43.0					Bottom of Hole at 43.0 ft below ground surface	
45							
50							

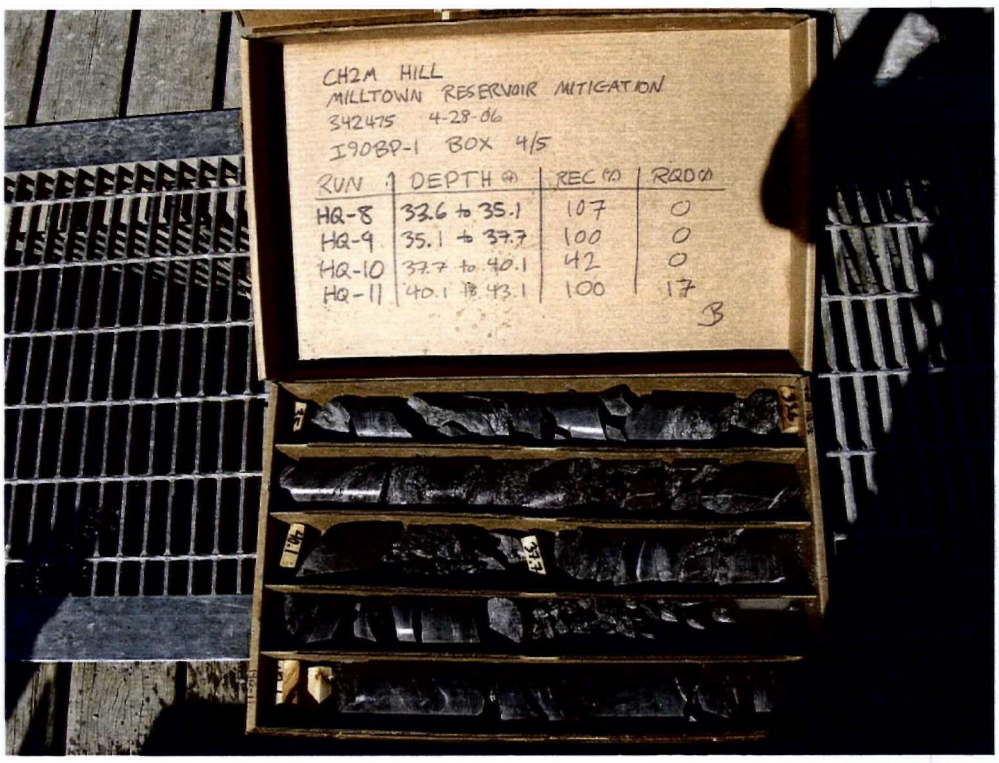
Appendix B

Rock Core Photo Logs

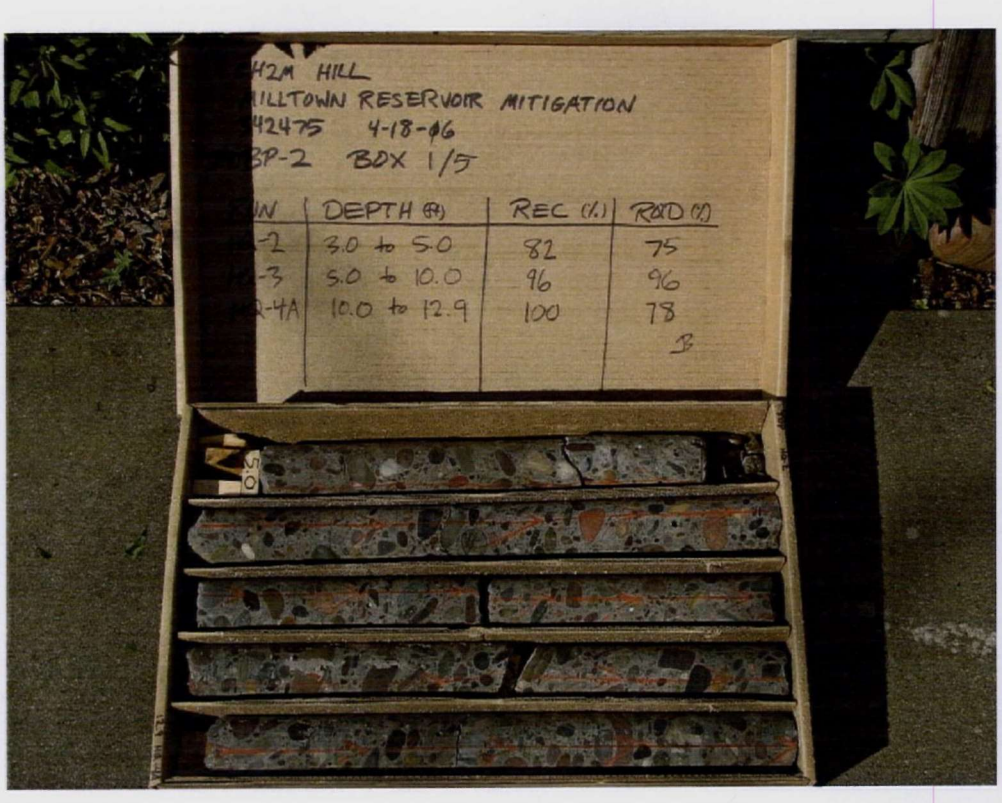

CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342375 4-28-06
I90BP-1 BOX 1/5
RUN | DEPTH (ft) | REC (%) | RQD (%)
HQ-1 | 0.1 to 5.1 | 100 | 92
HQ-2 | 5.1 to 10.1 | 98 | 94
B

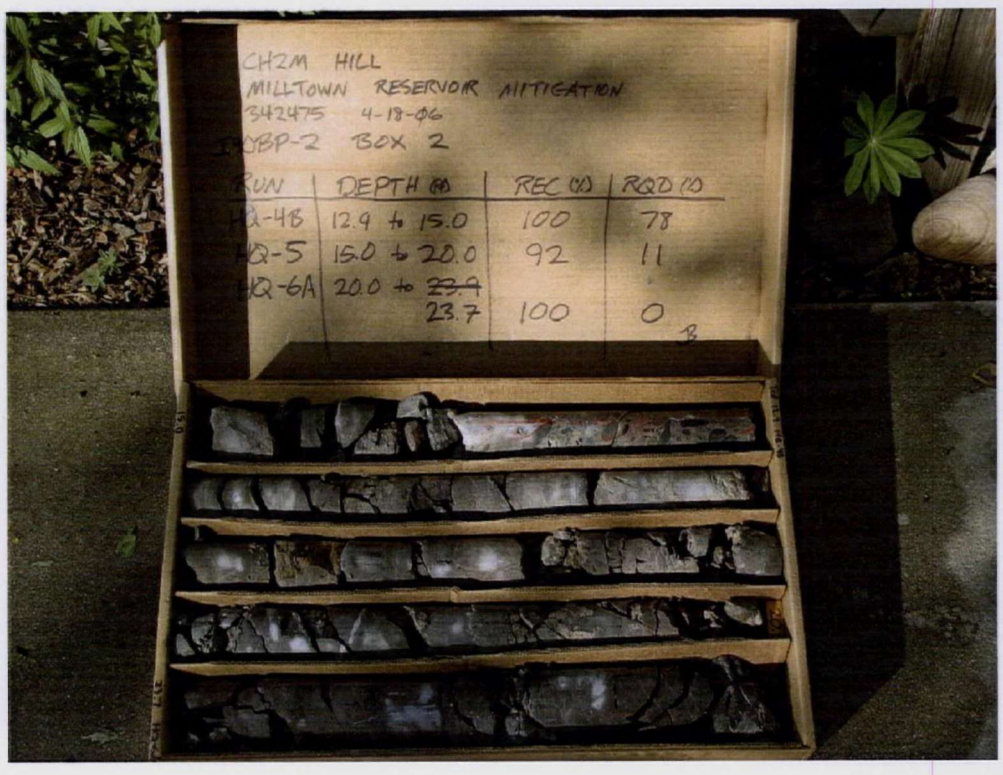

CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-28-06
I90BP-1 BOX 2
RUN | DEPTH (ft) | REC (%) | RQD (%)
HQ-3 | 10.1 to 15.1 | 70 | 17 (CONCRETE)
HQ-4 | 15.1 to 20.1 | 46 | 0
HQ-5A | 20.1 to 24.4 | 92 | 10
B


CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-28-06
I90BP-1 BOX 3/5
RUN | DEPTH (ft) | REC(%) | RQD(%)
HQ-5B | 24.4 to 25.1 | 92 | 10
HQ-6 | 25.1 to 30.1 | 100 | 0
HQ-7 | 30.1 to 33.6 | 97 | 11
B


CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-28-06
I90BP-1 BOX 4/5
RUN | DEPTH (ft) | REC (%) | RQD (%)
HQ-8 | 33.6 to 35.1 | 107 | 0
HQ-9 | 35.1 to 37.7 | 100 | 0
HQ-10 | 37.7 to 40.1 | 42 | 0
HQ-11 | 40.1 to 43.1 | 100 | 17
B

CH2M HILL
342475.A1.04.T1
Milltown Reservoir Bridge Mitigation: 2006 Geotechnical Exploration
I90BP-1 Photo Log Sheet


H2M HILL
ILLTOWN RESERVOIR MITIGATION
42475 4-18-06
BP-2 BOX 1/5
DEPTH (ft)
REC (%)
RQD (%)
3.0 to 5.0
5.0 to 10.0
10.0 to 12.9
82
96
100
75
96
78


CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-18-06
I90BP-2 BOX 2
DEPTH (ft)
REC (%)
RQD (%)
12.9 to 15.0
15.0 to 20.0
20.0 to 23.7
100
92
100
78
11
0

CH2M HILL
342475.A1.04.T1
Milltown Reservoir Bridge Mitigation: 2006 Geotechnical Exploration
Photo Log Sheet

SW1-1

CH2M HILL
342475.A1.04.T1
Milltown Reservoir Bridge Mitigation: 2006 Geotechnical Exploration
Photo Log Sheet

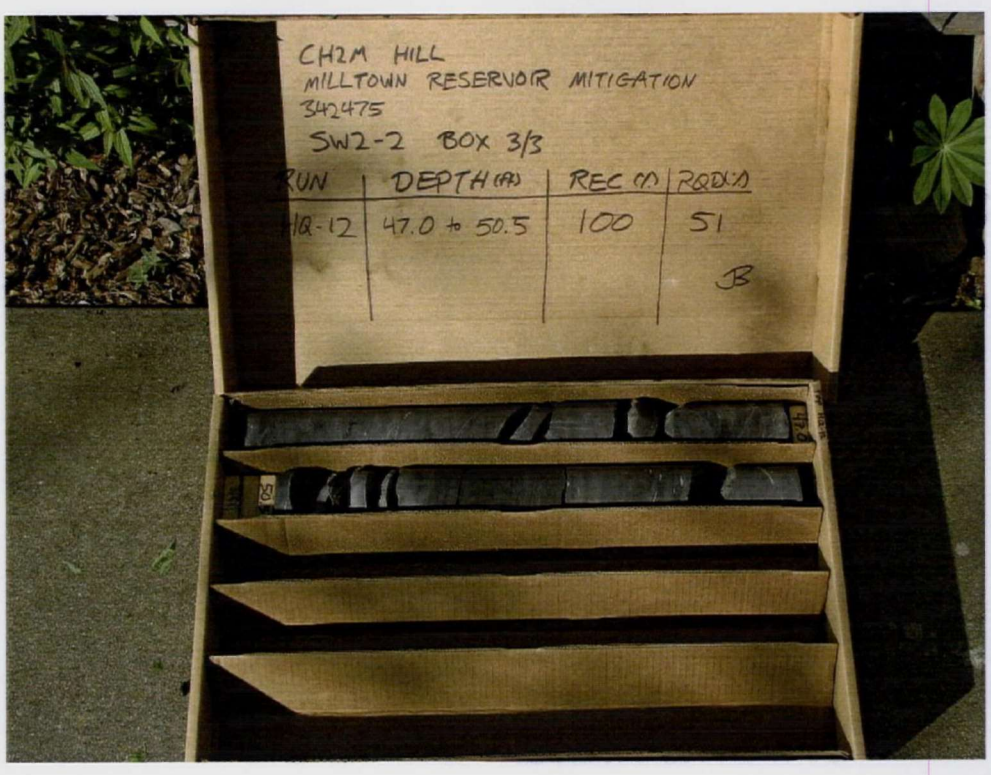
SW1-2


CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-25-06
SW2-1 BOX 1/2
RUN | DEPTH (ft) | REC (%) | RQD (%)
HQ-5 | 20.0 to 21.5 | 100 | 0
HQ-6 | 21.5 to 24.0 | 96 | 60
HQ-7 | 24.0 to 29.0 | 98 | 0
B


CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-25-06
SW2-1 BOX 2/2
RUN | DEPTH (ft) | REC (%) | RQD (%)
HQ-8 | 29.0 to 34.0 | 102 | 0

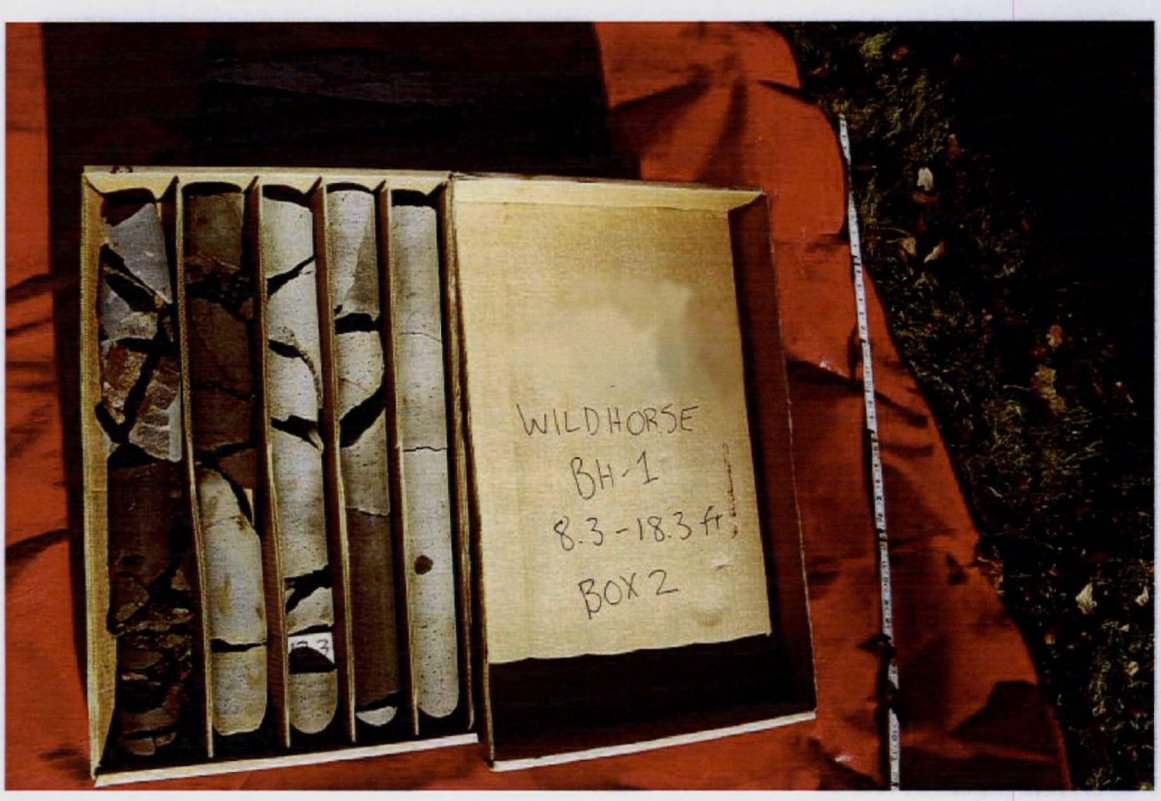

CH2M HILL
MILLTOWN RESERVOIR MITIGATION
342475 4-17-06
SW2-2 BOX 1/3
RUN | DEPTH | REC (%) | RQD (%)
HQ-7 | 27.0 to 30.0 | 83 | 0
HQ-8 | 30.0 to 32.2 | 100 | 0
HQ-9 | 32.2 to 37.2 | 100 | 15
B


2M HILL
ILLTOWN RESERVOIR MITIGATION
42475 4-17-06
W2-2 BOX 2/3
UN | DEPTH (ft) | REC (%) | RQD (%)
Q-10 | 37.2 to 42.2 | 100 | 40
Q-11 | 42.2 to 47.0 | 100 | 28
B



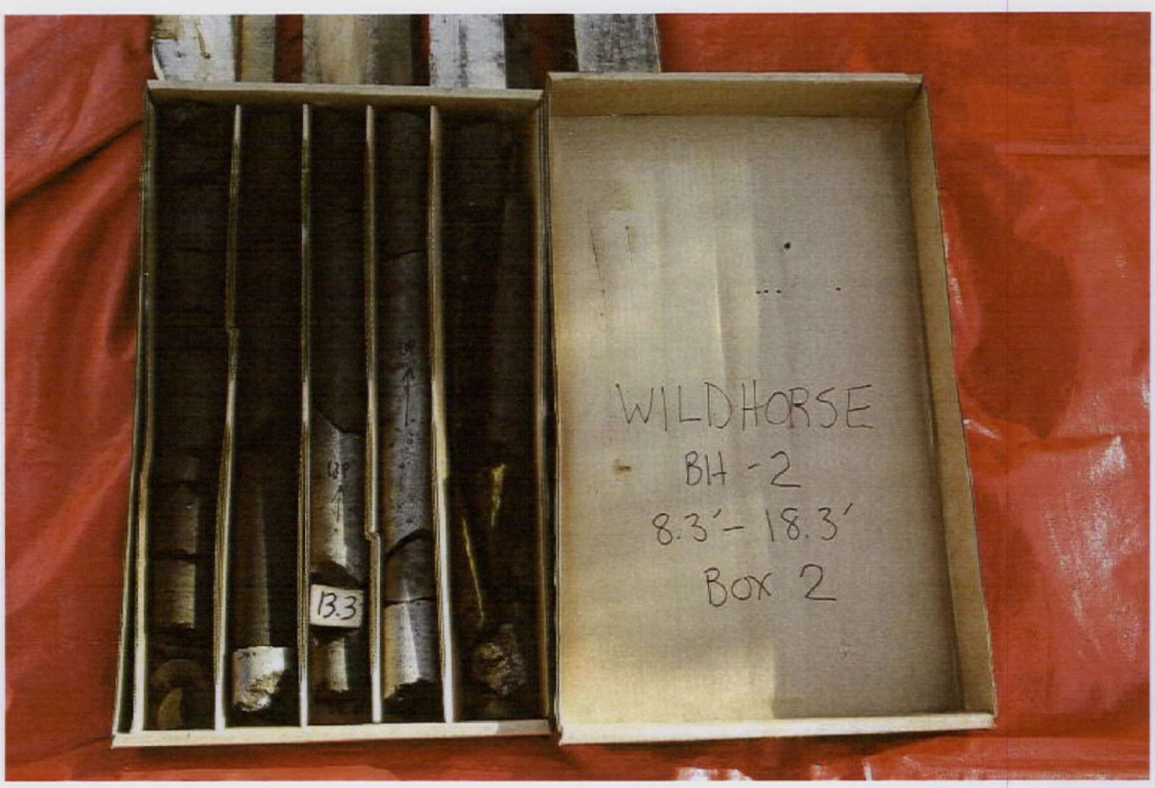
CH2M HILL
342475.A1.04.T1
Milltown Reservoir Bridge Mitigation: 2006 Geotechnical Exploration
Photo Log Sheet

SW2-2



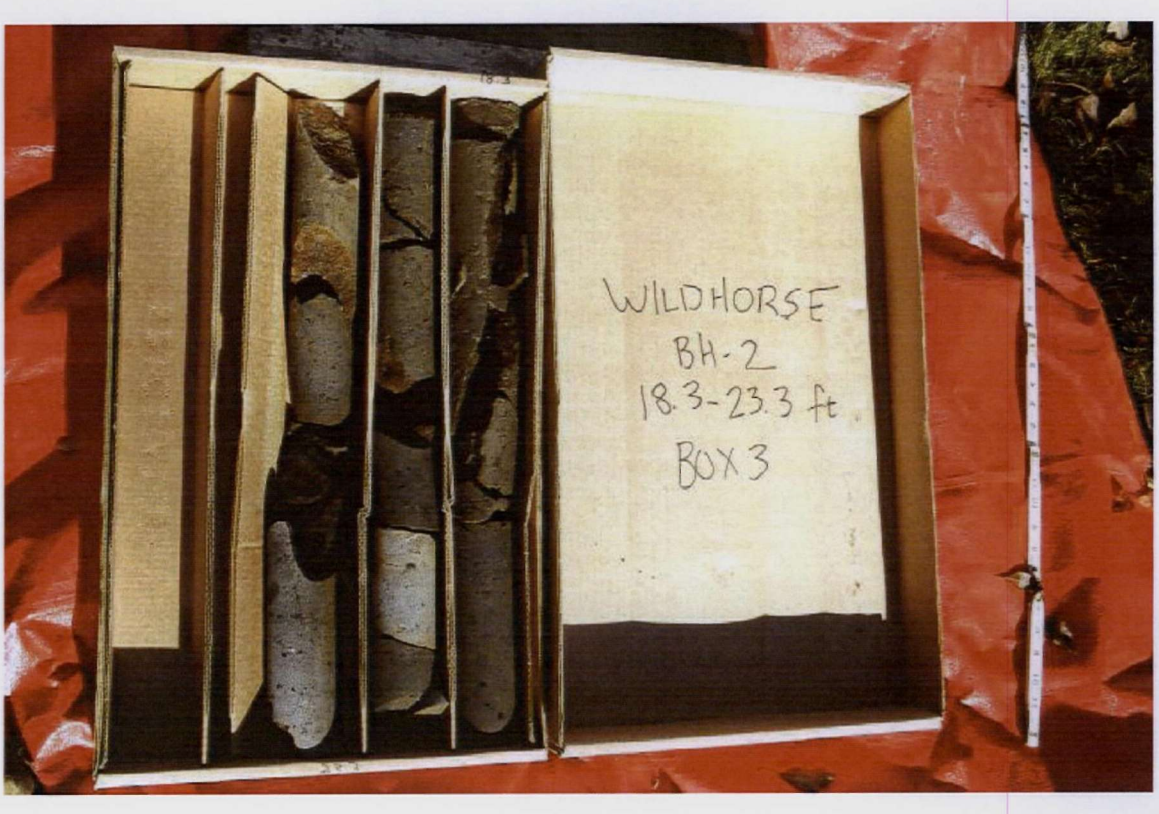
CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BH-1



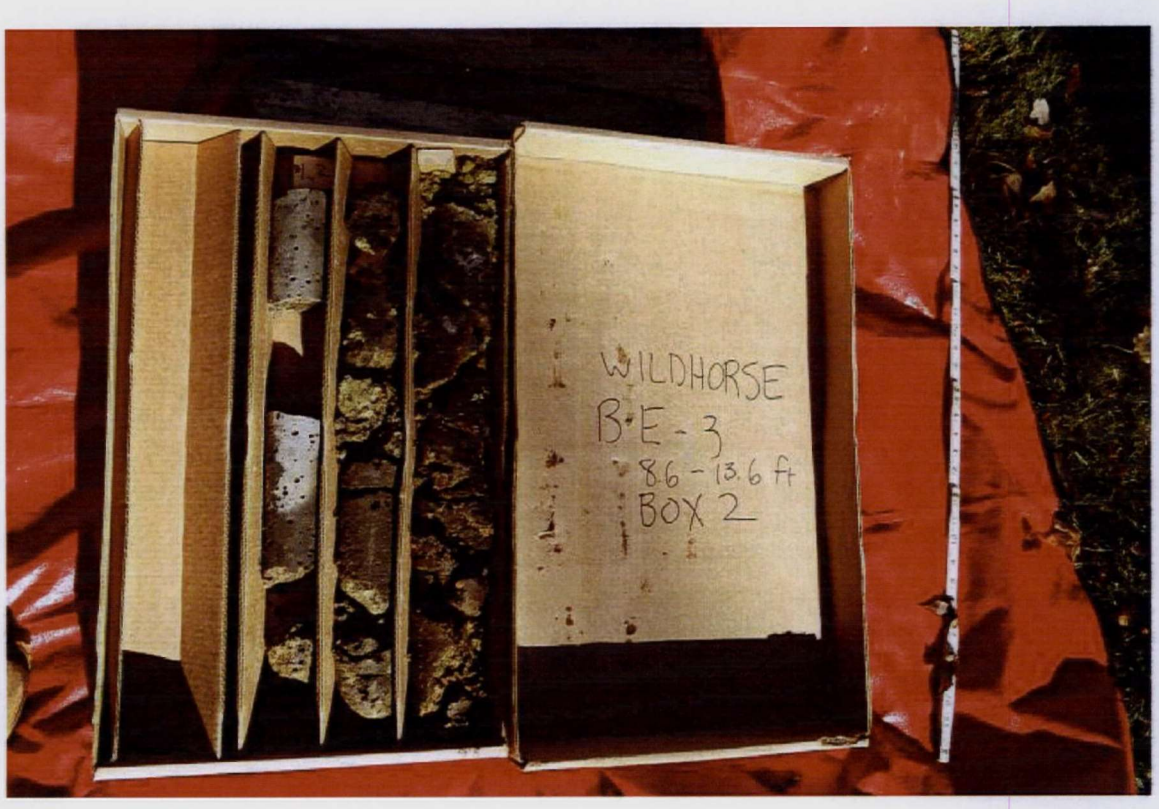
CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BH-2



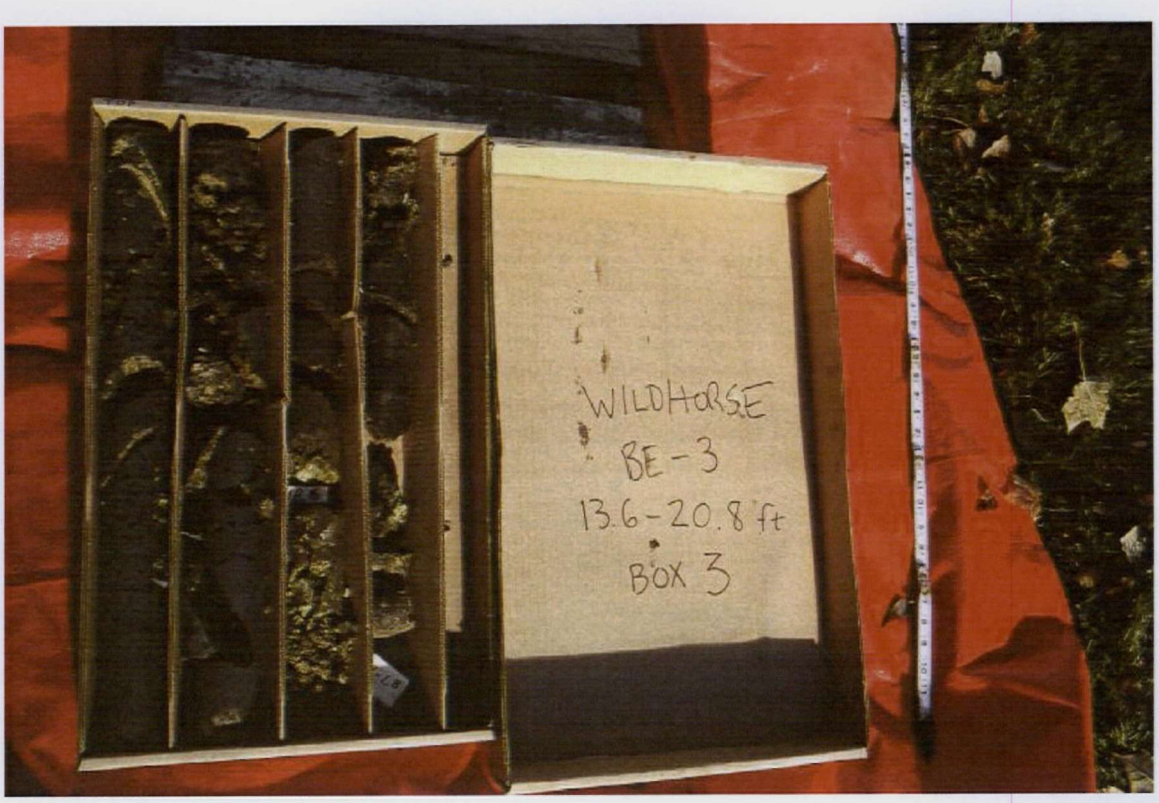
CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BH-2



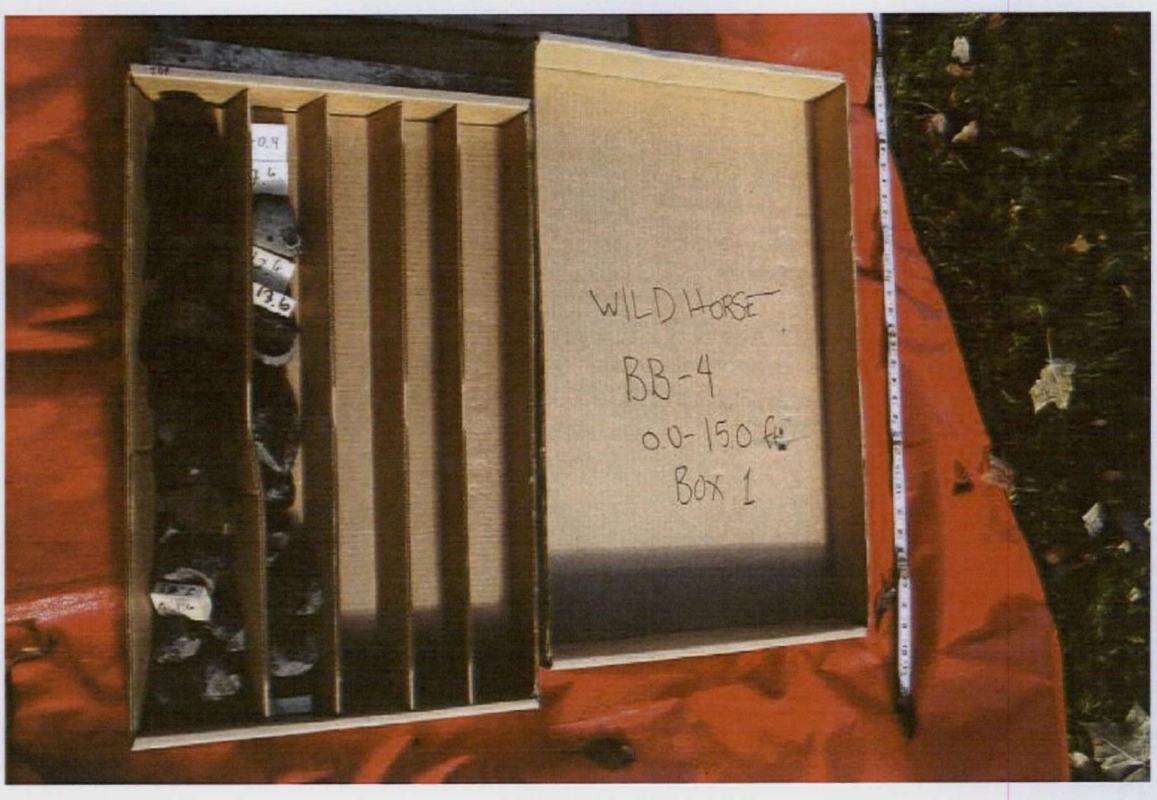
CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BE-3



CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BE-3

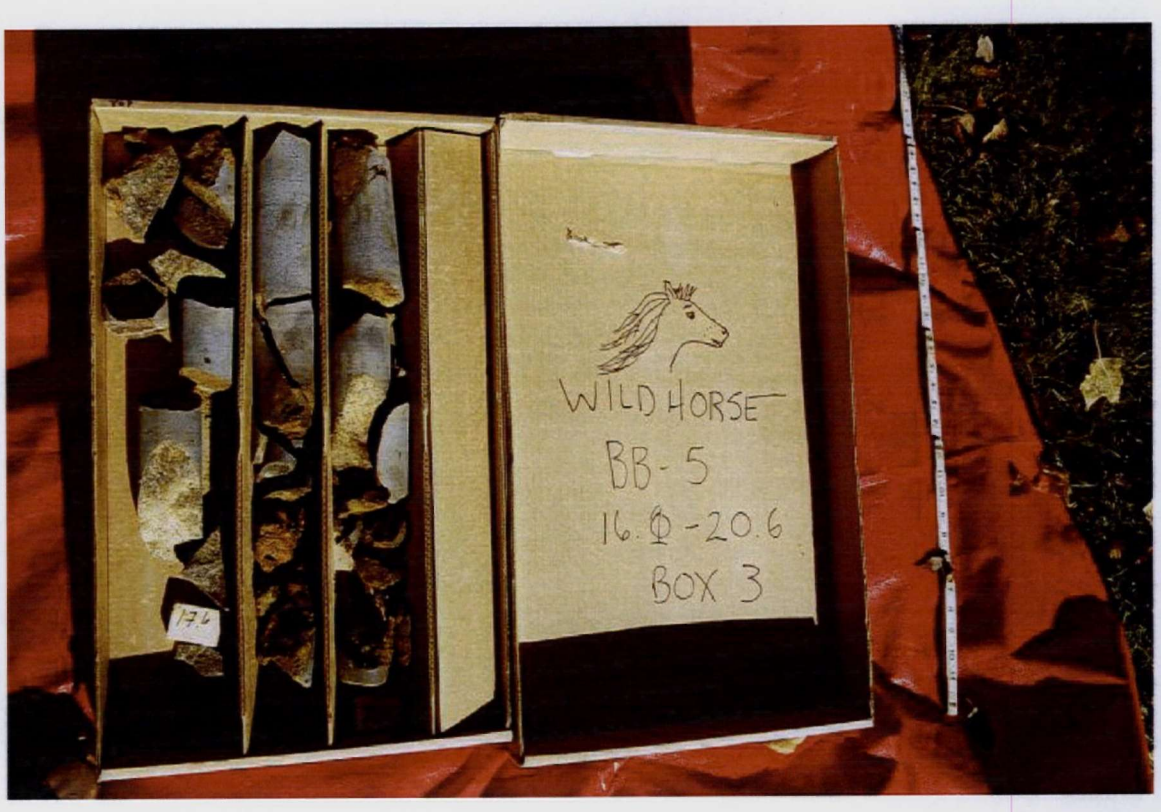


CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BB-4

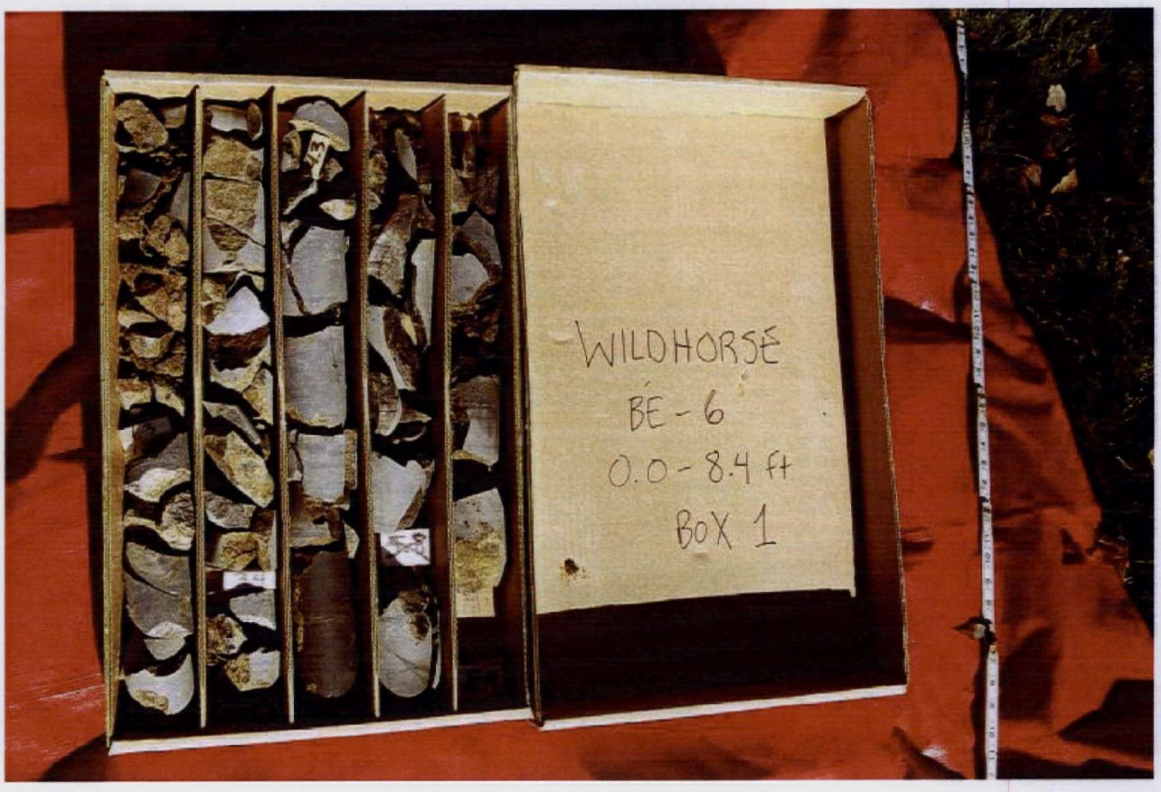
CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BB-5



CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BB-5



CH2M HILL
179679.D1.01
Wild Horse Quarry Exploration
Photo Log Sheet

BE-6

CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

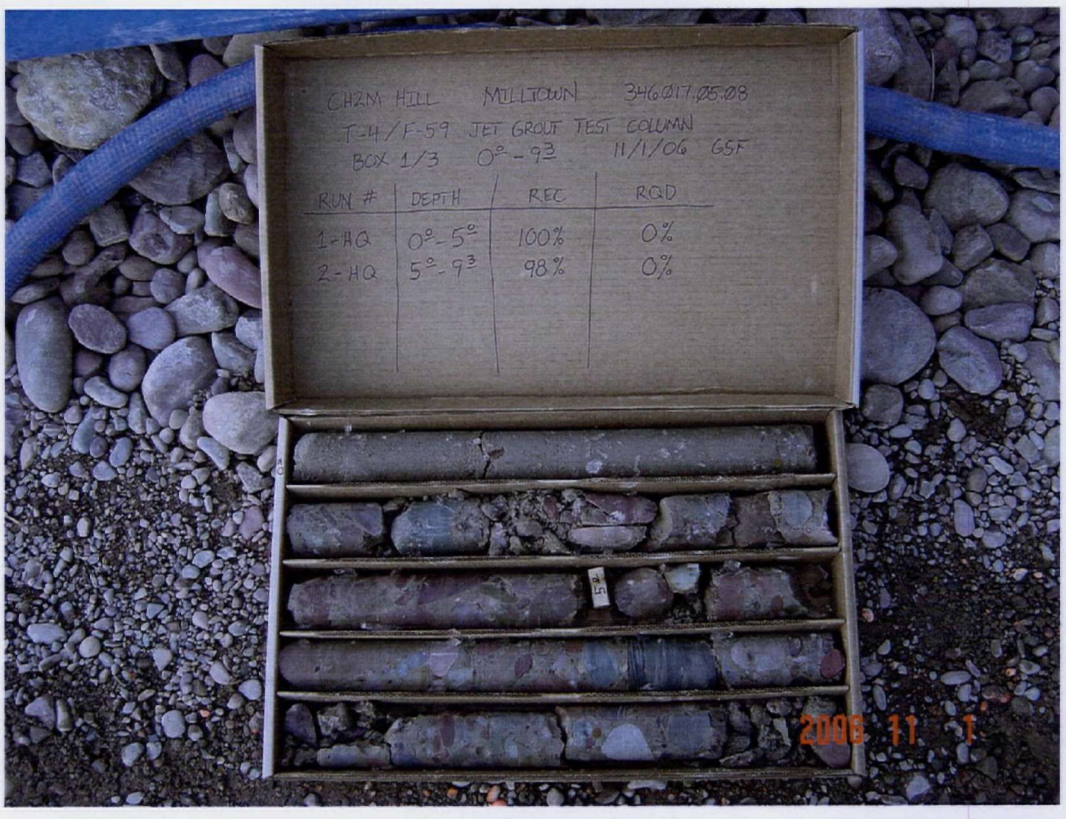
T-1/N-5

CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

T-1/N-5

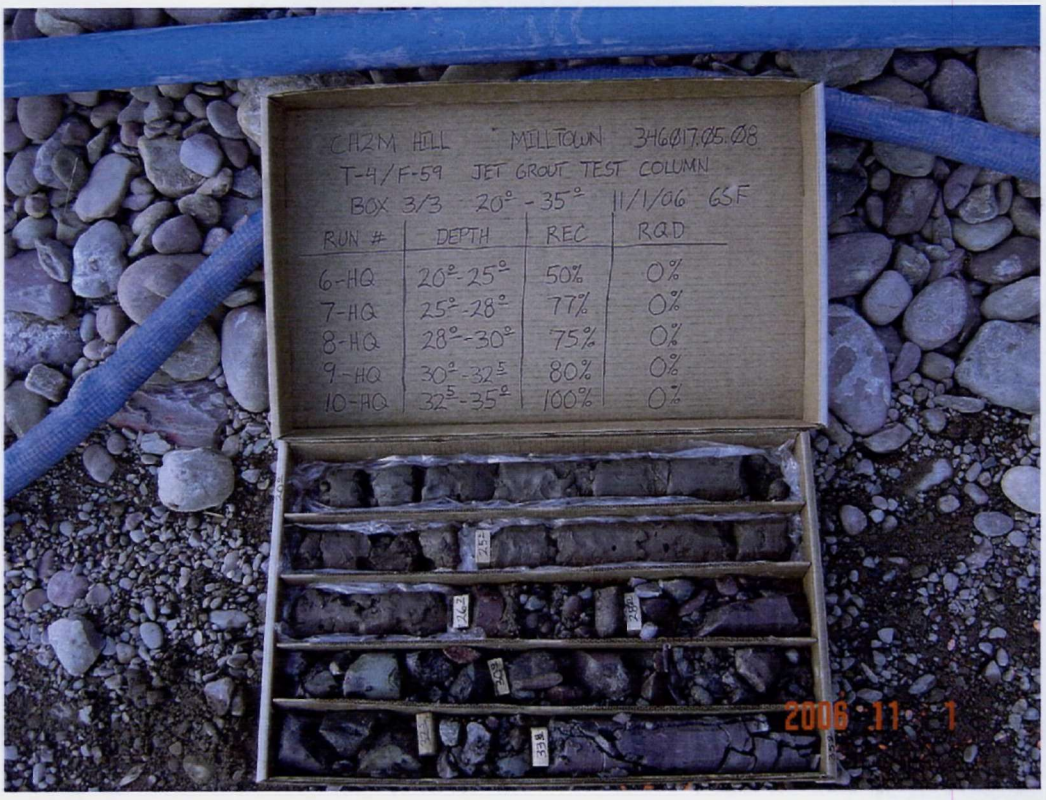
CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

T-1/N-5



CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

T-4/F-59 (changed to T-5/F-59 in Data Report)



CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

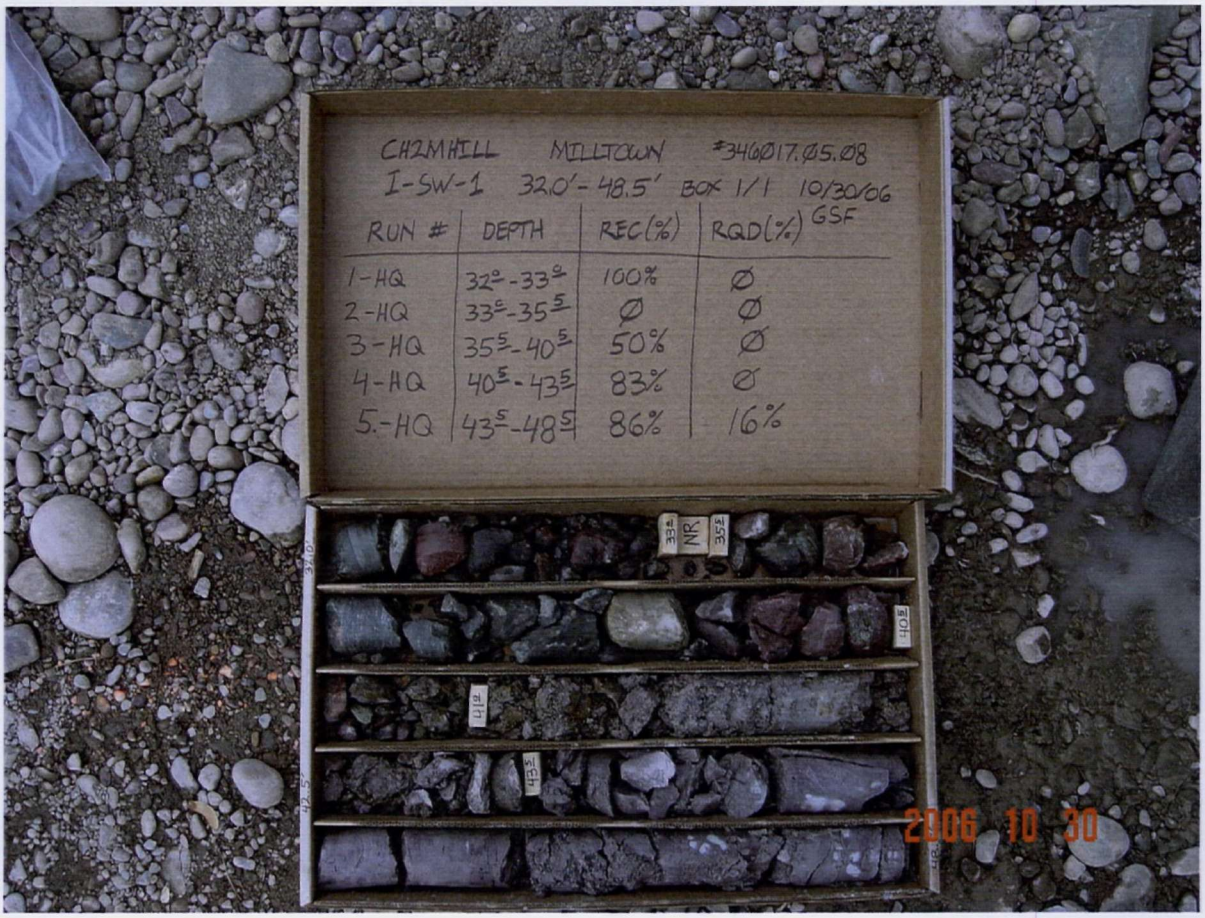
T-4/F-59 (changed to T-5/F-59 in Data Report)

CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

T-5/F-57 (changed to T-6/F-57 in Data Report)

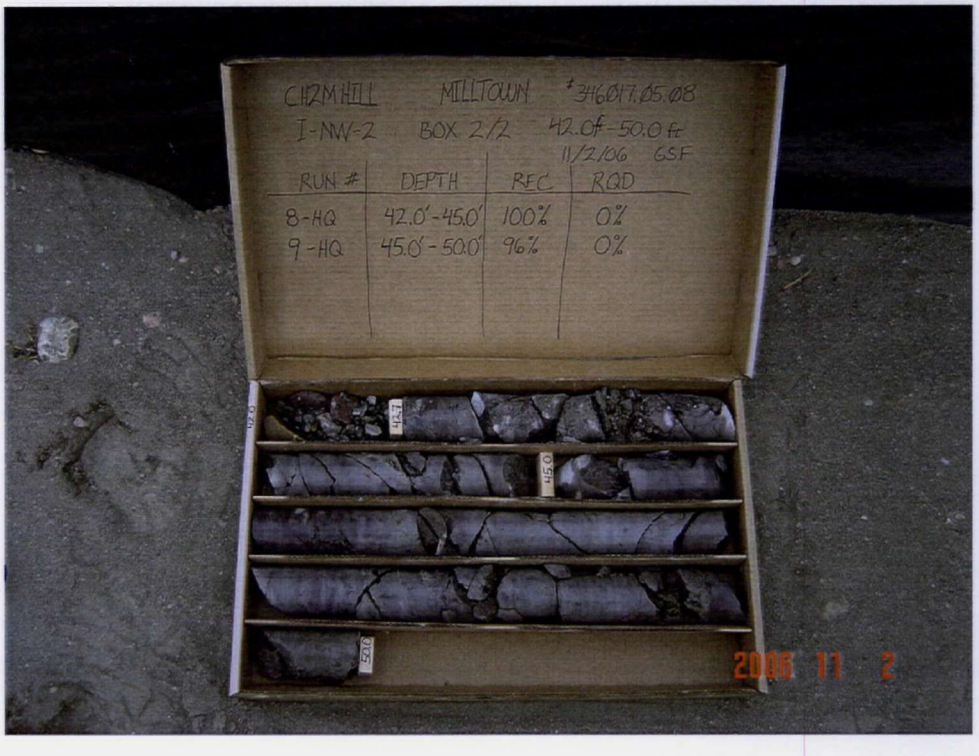
CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Jet Grout Test Columns
Photo Log Sheet

T-5/F-57 (changed to T-6/F-57 in Data Report)



CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Inclinometer Installation
Photo Log Sheet

I-SW-1



CH2M HILL
Milltown Bridge Infrastructure Mitigation—346017.05.08
I-90 Bridges – Inclinometer Installation
Photo Log Sheet

I-NW-2

Appendix C

Laboratory Tests/Geotechnical Index Parameters

Milltown Bridge Mitigation Project
CH2M HILL

Moisture Contents and Percent Passing 75 micron
Table 1

Exploration Number	Sample Number	Sample Depth (ft)	Moisture Content %	Percent Passing U.S. Sieve No. 200
EB-2	SS-5	N/A	33	7
EB-2	SS-10	N/A	24	33
EB-2	ST-1	2.1-2.2	35	90
EB-2	ST-2	4.0-4.1	38	91
EB-2	ST-7	16.7-16.8	66	100
EB-2	ST-8	19.7-19.8	27	85
EB-2	ST-9	21.3-21.4	24	62
PB-2	SS-1	3.5-5.0	86	88
PB-2	SS-6	13.5-15.0	32	41
PB-2	SS-8	18.5-20.0	29	44
SW-1-1	SS-11	25.0-26.5	32	35
SW-1-1	ST-1	1.3-2.8	82	75
SW-1-1	ST-2	4.7-4.8	60	57
SW-1-1	ST-3	6.1-6.2	38	67
SW-1-1	ST-9	20.2-20.3	49	95
SW-1-1	S-4	9.7-9.9	24	3
SW1-3	SS-1/SS-2	3.5-5.0 / 5.5-7.0	57	6 [1]
SW-1-3	ST-5	11.1-11.6	54	97
SW-2-1B	ST-3	9.0-9.5	58	93
SW-2-2	SS-3	N/A	13	10
SW-2-3	DMS-2	6.0-7.5	52	65 [1]
SW-3-1	SS-2	7.5-9.0	74	66 [1]
SW-3-1	ST-5	16.5-16.7	36	87
SW-3-2	SS-2A	10.0-11.5	31	11
SW-3-2	SS-2B	10.0-11.5	39	82
SW-4-1	SS-4	10.0-11.5	23	42

[1)] Sample contained substantial organics such as bark & wood greater than 75 microns.

CH2M Hill
Milltown Bridge Mitigation
Project No: 342475.A1.04.T1
Sample Index Parameters: Water Content, Total Volatile Solids & PH

Exploration	Sample	Depth	WC % [1]	TVS % [2]	pH [3]
SW-1-1	ST-7	15.0-17.0	46	1.3	6.97
SW-1-1	SS-14	40.0-41.5	18	0.2	7.86
SW-1-2	DMS-2	N/A	31	0.4	7.48
SW-1-2	SS-7	N/A	17	0.4	7.14
SW-1-3	SS-6	13.0-14.4	85	10.3	6.97
SW-1-3	SS-7	17.5-19.0	4	0.3	5.04
SW-2-1	SS-1	N/A	7	0.3	7.93
SW-2-1	SS-2	7.0-8.5	54	4.0	7.22
SW-2-2	SS-2	N/A	66	5.4	7.26
SW-2-2	SS-5	N/A	13	.2	4.60
SW-2-3	DMS-2	6.0-7.5	53	5.9	7.06
SW-4-1	SS-4	10.0-11.5	23	1.7	5.95
SW-4-1	SS-8	30.0-31.5	10	0.3	6.31
SW-4-2	SS-3	N/A	10	0.3	7.18
SW-4-2	SS-8	N/A	6	0.2	4.27

1) Water Content, WC method used ASTM D-2216
2) ASTM D–2974, Method C used for TVS analysis
3) pH analysis: Baseline pH of distilled water added to as-received soil samples is 5.64. 1:1 solution (soil / distilled water) was prepared to measure soil pH

Soil Technology
06-2143

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-1-1
Sample No. ST-1
Depth of Sample 1.0 – 2.8'
Sampled Length (from log) 1.8 – 2.8' (feet)
Sample Recovery 1.0 (feet)

Date 05/01/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair __poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			1.0		
			1.5		Top of Recovery
					Disturbed
					Soft, wet, tan silt
Jar	83	WC	2.0		
					Crack
	25	WC			
		-200			
	28	WC	2.5		Dense, wet, tan, silty sand (SM)
					Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-1-1
Sample No. ST-3
Depth of Sample 5.0 – 7.0'
Sampled Length (from log) 5.4 – 7.0' (feet)
Sample Recovery 1.6 (feet)

Date 05/01/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
					Top of Recovery
	53	WC	5.5		Medium stiff, wet, tan sandy silt to silty sand PP = 1.0 TSF
			6.0		
	55	CON			Medium stiff, wet, tan silt with sand Substantial organics and roots
			6.5		Siltier
	36	WC			Loose, wet, tan silty sand (SM)
					Siltier
			7.0		Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-1-1
Sample No. S-4
Depth of Sample 8.9-10.0'
Sampled Length (from log) 8.0-10.0 (feet)
Sample Recovery 1.1 (feet)

Date 08/16/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair __poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			8.0		
			8.5		Top of Recovery
	27	WC	9.0		Moist-dense,wet, tan Sand (SW)
		-200	9.5		Fines (-100) 3%
	24	WC			
			10.0		Bottom of Recovery

Vis. SW-1-1, S-4

Soil Technology
J-06-2143

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-1-1
Sample No. ST-5
Depth of Sample 10.8-12.0
Sampled Length (from log) 10 – 12 (feet)
Sample Recovery 1.2 (feet)

Date 08/10/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			10.0		
			10.5		Top of Recovery
					Wet,medium dense,tan sand with silt lenses
	26	WC	11.0		
			11.5		
	90	WC			Wet,medium dense,grey silt with sand With substantial wood fragments and organics
			12.0		Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-1-1
Sample No. ST-9
Depth of Sample 19.0-21.0
Sampled Length (from log) 19.2-21.0' (feet)
Sample Recovery 1.78 (feet)

Date 05/01/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair __poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			19.0		Top of Recovery
			19.5		Tan, wet, medium dense sand
					Sand
					Grey, soft, wet clay
	74	WC			
			20.0		
	70	WC			
	62	CON			TV = .05 TSF, PP = 0.0 TSF
					Grey, medium stiff, wet silt (ML)
			20.5		
	57	WC			TV = .30 TSF, PP = .5 TSF
Jar					
					Grey clay
	74	WC			TV = .20 TSF, PP = .50 TSF
			21.0		Bottom of recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-1-1
Sample No. ST-10
Depth of Sample 22.75 – 24.5'
Sampled Length (from log) 22.5 – 24.5' (feet)
Sample Recovery 1.75 (feet)

Date 05/01/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			22.5		Top of Recovery
	32	WC	23.0		Tan, loose, medium dense, wet-f-m sand w/silt (SM)
					Black wood
					Sand
	71	WC	23.5		Dark grey brown inbeded silt lense
					Sand
	89	WC	24.0		Loose, wet, tan, silty sand inbeded w/wood & org.
					Black Wood
			24.5		Bottom of Rcovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-2-1B
Sample No. ST-3
Depth of Sample 8.8 – 10.9'
Sampled Length (from log) 8.5-10.9' (feet)
Sample Recovery 2.1 (feet)

Date 05/19/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair __poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			8.5		Top of Recovery
			9.0		Disturbed, cracked
		CU			
Jar	56 WC	CON	9.5		TV = .1 TSF, PP = .40 TSF
Bag					
	44	WC	10.0		TV = .15 TSF
	66	WC	10.5		TV = .1 TSF
	64	WC			TV = .3 TSF
					Organics
			11.0		Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-3-1
Sample No. ST-3
Depth of Sample 10.2-12.5
Sampled Length (from log) 10.0-12.5' (feet)
Sample Recovery 2.3 (feet)

Date 08/21/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			10.0		Top of Recovery
	73	WC	10.5		Soft,wet,light grey Silt TV = .2 TSF, PP = .5 TSF
			11.0		
			11.5		Organics
	42	ATTB			LL=44, PL=30, PI=14
	47	HY	12.0		Wet, Tan Silt (ML)
			12.5		Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No SW-3-1
Sample No. ST-5
Depth of Sample 15.1-17.5 ft.
Sampled Length (from log) 15.0 – 17.5 ft. (feet)
Sample Recovery 2.4 (feet)

Date 08/21/06
Sample Pushed by RGSII
Sample Logged by RGSII
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good X fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			15.0		Top of Recovery
					Soft,wet,brown sandy Silt
	29	WC	15.5		TV = .1 TSF, PP = .2
	39	WC	16.0		TV = .18 TSF, PP = .3
	36	WC	16.5		Soft,wet,Silt w/sand
		-200			(-200) 87
	35	ATTB			LL=34, PL=32, PI=2, Silt (ML)
			17.0		
					Soft,wet,brown Silt
	31	WC			TV= .13 TSF, PP = .3 TSF
			17.5		Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No EB-2
Sample No. ST-1
Depth of Sample .7 – 2.3'
Sampled Length (from log) 0.6 – 2.3' (feet)
Sample Recovery 1.6 (feet)

Date 04/17/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair __poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
					Tube contained substantial fine roots
			.5		Top of Recovery
			1.0		Soft, wet, tan fibrous peat
Bag A	86	WC			Soft, wet, tan silt w/organics TV = .05 TSF, PP = 0 TSF
			1.5		
	30	WC			Tan, loose, wet silty sand (SM)
	54	WC			Sandy silt (MC)
			2.0		TV = .10 TSF
		CON			Soft, wet, tan, silt (MH)
	58	WC			TV = .10 TSF, PP = .15 TSF
					Bottom of Recovery/ Organics, roots, etc.
			2.5		
			3.0		

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No EB-2
Sample No. ST-2
Depth of Sample 2.5 – 4.5'
Sampled Length (from log) 2.86 – 4.5' (feet)
Sample Recovery 1.65 (feet)

Date 04/06/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			2.5		Top of Recovery 2.86'
					Very soft, wet, tan fiborous silt w/substantial roots
					Disturbed
	69	WC	3.0		
					Crack 1/8" void
	30	WC			Tan, loose, wet silty sand
	59	WC			TV = .10 TSF, PP = .2 TSF
			3.5		
	58	CU			
					TV = 0 TSF and PP = 0 TSF
	64	CON	4.0		Very soft, wet, tan silt (ML) w/substandial rootlets
	37	WC			Loose, wet, tan sand with silt
			4.5		Bottom of Recovery

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No EB-2
Sample No. ST-7
Depth of Sample 15.6 – 17.0'
Sampled Length (from log) 15 – 17.0' (feet)
Sample Recovery 1.4 (feet)

Date 04/03/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good _fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			16.0		Paper towels
			15.5		Top of Recovery
					Loose, wet, M-F, Sand
	29	WC	16.0		
					Silty sand
			16.5		
	66	WC			
		CON			
		ATTB			Soft, wet, grey silt
	69	WC			TV = .10TSF, PP = .05TSF
			17.0		Bottom of Recovery
			17.5		

SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No EB-2
Sample No. ST-8
Depth of Sample 18.3 - 20'
Sampled Length (from log) 18 – 20' (feet)
Sample Recovery 2.0 (feet)

Date 04/06/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair _poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			18.0		Top of Recovery
					Disturbed, sagging
	32	WC			Loose, wet, tan silty M-F sand (SM)
			18.5		TV = 0 TSF, PP = 0 TSF
	39	WC			TV = .10 TSF, PP = .5 TSF
			19.0		Very soft, wet, tan silt (ML)
	40	CU			
			19.5		
	70	WC			Organics & sand lenses/Crack
	39	CON			
					Loose, wet, tan silty sand (SM)
			20.0		Bottom of Recovery

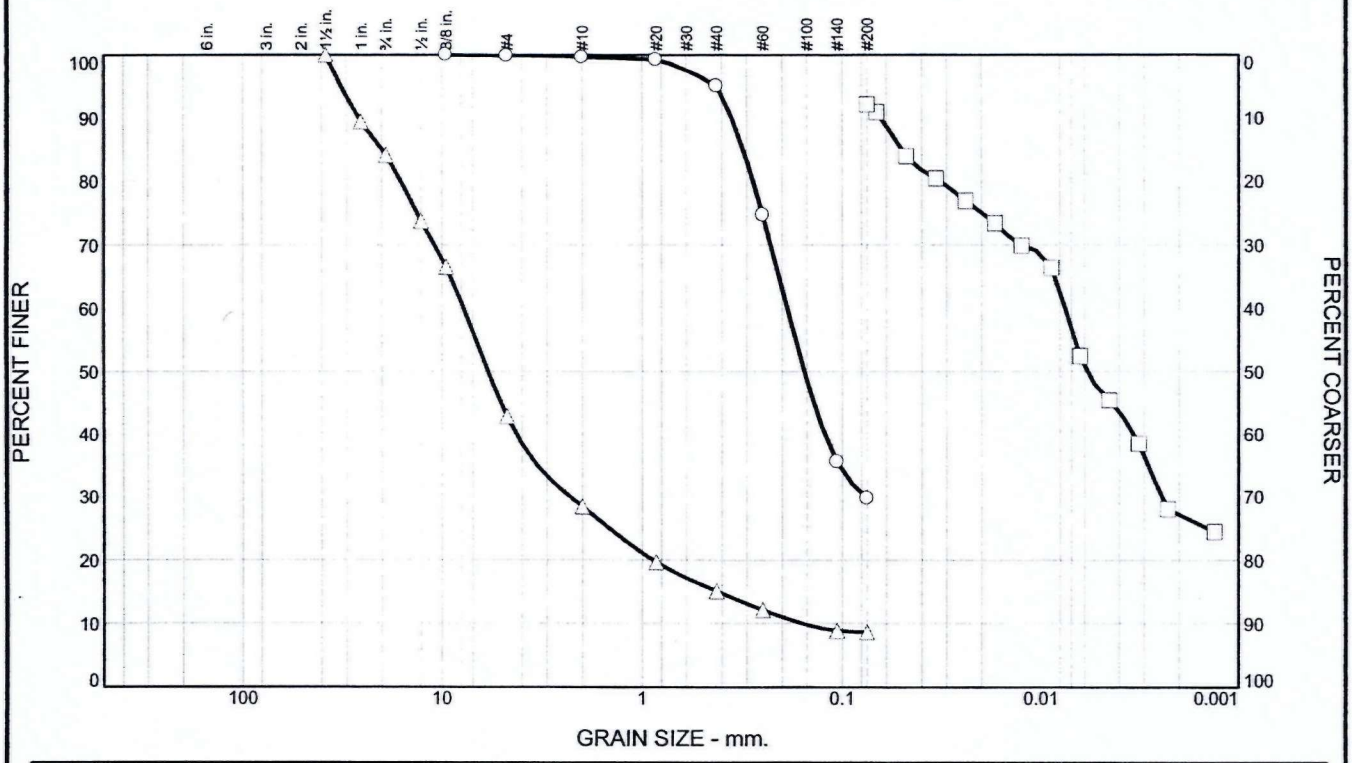
SHELBY TUBE VISUAL DESCRIPTION

Job Milltown Bridge Mitigation Project
Job No. 06-2143
Exploration No EB-2
Sample No. ST-9
Depth of Sample 20 – 22'
Sampled Length (from log) 20.5 – 22' (feet)
Sample Recovery 1.5 (feet)

Date 04/11/06
Sample Pushed by RGS
Sample Logged by RGS
Type of Sample X shelby ___ other
Diameter of Sample 2.85 (inches)
Sample Quality X good __fair __poor __ Disturbed

Specimen saved	Water content (%)	Test Type	Depth (ft)	Core	Classification and Description
			20.0		Top of Recovery
	28	WC	20.5		
	28	WC CU1			Soft, wet, tan, silt (ML) with sand
			21.0		
	30	WC CU2	21.5		
	30	CON			
	28	WC			TV = 0 TSF, PP = .4
			22.0		Bottom of Recovery

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	70.2	29.7		SM			
□				46.9		MH		37	76
△	0.0	57.2	34.2	8.6		GP-GM			

SIEVE inches size	PERCENT FINER ○	□	△
1.5			100.0
1			89.4
.75			84.1
.5			73.8
.375	100.0		66.6
	GRAIN SIZE		
D_{60}	0.1883	0.0075	7.7730
D_{30}	0.0769	0.0025	2.3200
D_{10}			0.1594
	COEFFICIENTS		
C_c			4.34
C_u			48.76

SIEVE number size	PERCENT FINER ○	□	△
#4	99.9		42.8
#10	99.6		28.4
#20	99.2		19.7
#40	95.1		15.1
#60	74.7		12.1
#140	35.5		8.9
#200	29.7	92.1	8.6

USC Classification
○ Silty sand
□ Elastic silt
△ Poorly graded gravel with silt and sand

REMARKS:
○
□
△

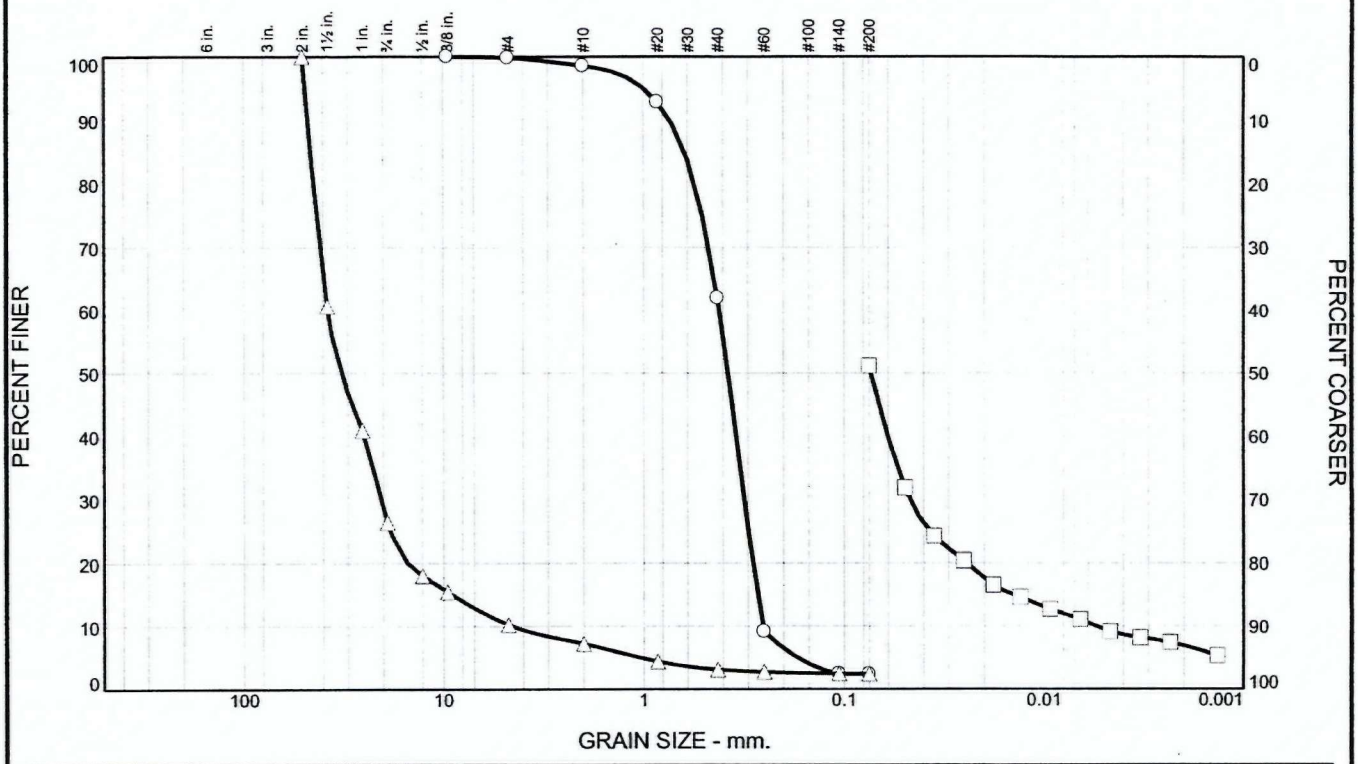
○ Location: ,PB-1,SS-1 Depth N/A Depth: N/A Sample Number: SS-1
□ Location: ,SW-1-1, SS-8 Depth 17.5-19.0 ft Depth: 17.5-19.0 ft Sample Number: SS-8
△ Location: ,SW-1-1,SS-12 Depth 30.0-31.5 ft Depth: 30.0-31.5 ft Sample Number: SS-12

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 Figure 1

Tested By: RGSII **Checked By:** RGS

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.2	97.4	2.4		SP			
□								NP	NV
△	0.0	89.7	7.9	2.4		GW			

SIEVE inches size	PERCENT FINER ○	□	△
2			100.0
1.5			60.7
1			41.0
.75			26.4
.5			18.0
.375	100.0		15.5
	GRAIN SIZE		
D_{60}	0.4159		37.8274
D_{30}	0.3133	0.0467	20.5151
D_{10}	0.2529	0.0055	4.5302
	COEFFICIENTS		
C_c	0.93		2.46
C_u	1.64		8.35

SIEVE number size	PERCENT FINER ○	□	△
#4	99.8		10.3
#10	98.5		7.2
#20	92.9		4.4
#40	62.0		3.1
#60	9.2		2.7
#140	2.4		2.5
#200	2.4	51.2	2.4

USC Classification
○ Poorly graded sand
□
△ Well-graded gravel

REMARKS:
○
□
△

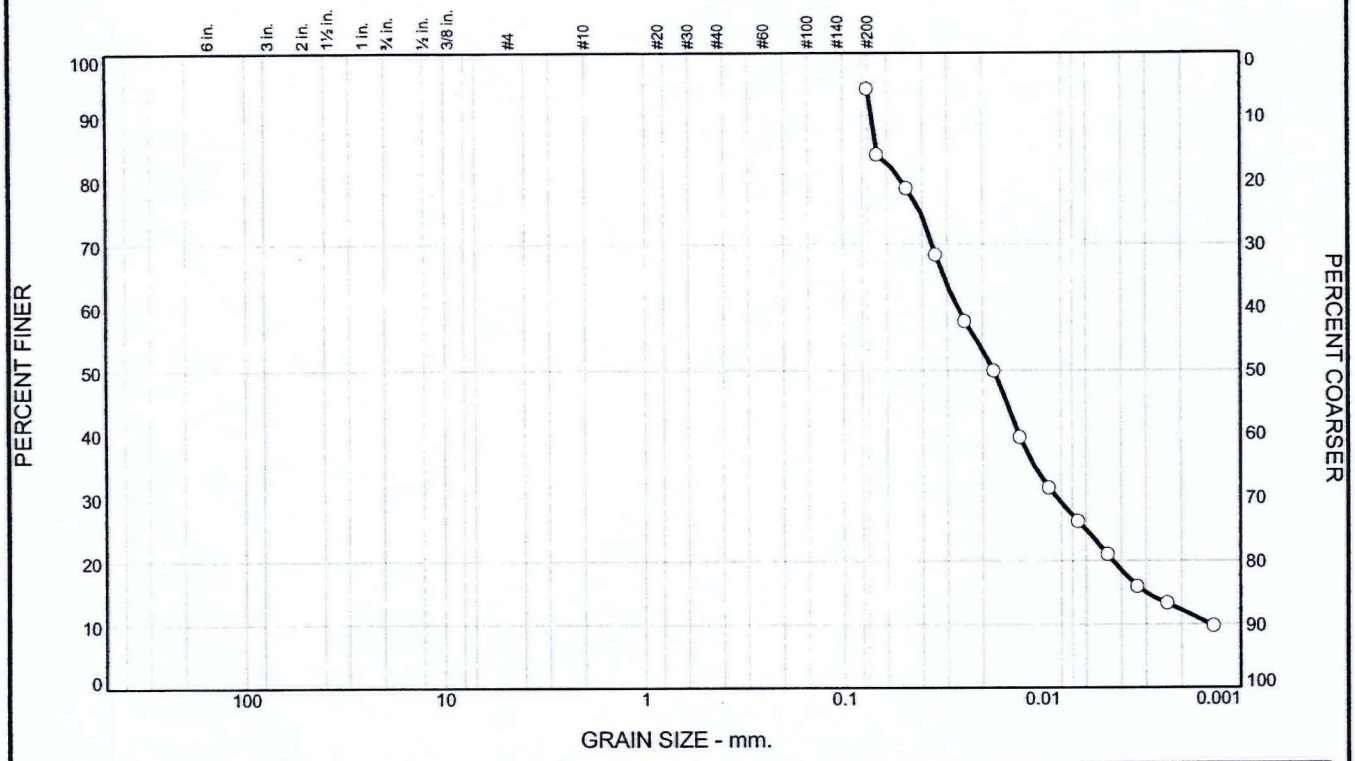
○ Location: SW-1-2,DMS-2, Depth N/A Depth: N/A Sample Number: DMS-2
□ Location: ,SW-3-1,SS-2 Depth 7.0-9.0 ft Depth: 7.5-9.0 ft Sample Number: SS-2
△ Location: ,SW-3-1,HQ-10 Depth 37.0 ft Depth: 37.0 ft Sample Number: HQ-10

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 Figure 2

Tested By: RGSII **Checked By:** RGS

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○					22.1	ML		30	44

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.0267		
D_{30}	0.0084		
D_{10}	0.0014		
	COEFFICIENTS		
C_c	1.86		
C_u	18.72		

SIEVE number size	PERCENT FINER ○		
#200	94.3		

USC Classification
○ Tan, silt

REMARKS:
○

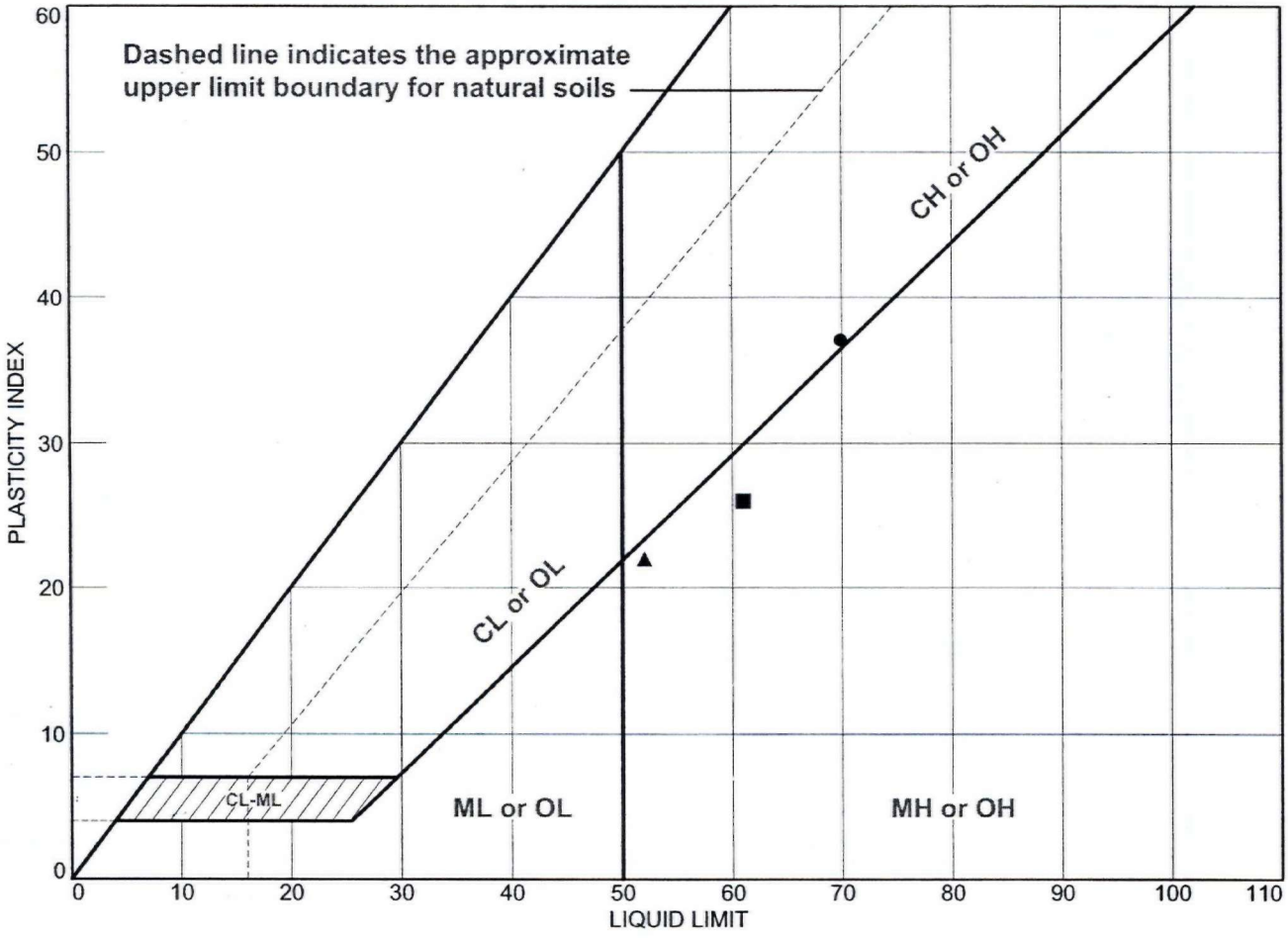
○ Source of Sample: SW-3-1 Depth: 11.7-12.0 ft Sample Number: ST-3

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 Figure 3

Tested By: RGS **Checked By:** Richard G. Sheets, Sr.

ATTERBERG LIMITS (ASTM D-4318)



SOIL DATA

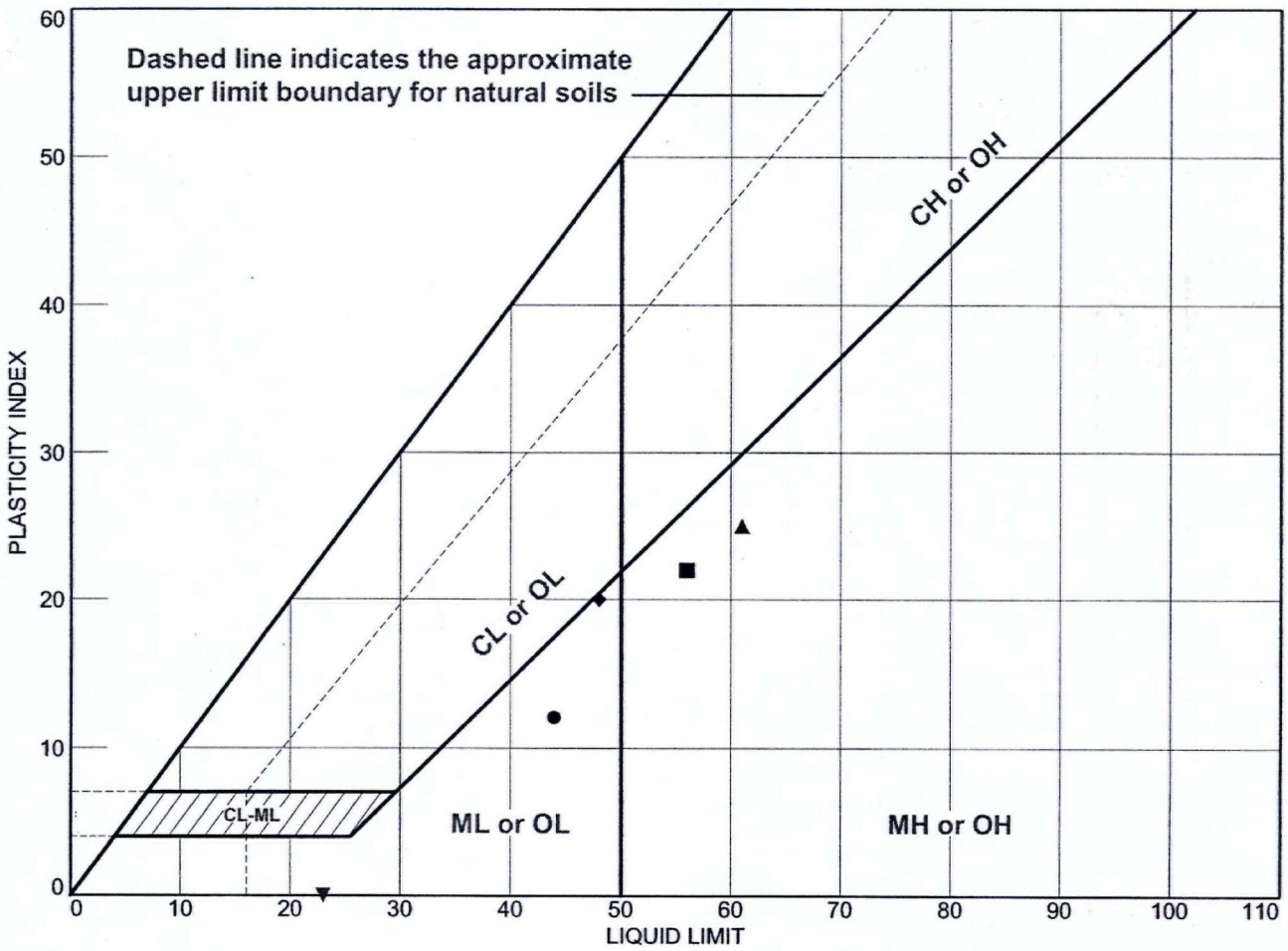
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SW-1-3	ST-5	11.0-11.1	65.3	33	70	37	CH
■	SW-1-3	VS-3	---	84.9	35	61	26	MH
▲	SW-2-1B	ST-3	9.5-9.6 ft.	54.8	30	52	22	MH

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 **Figure** 4

Tested By: _____ **Checked By:** _____

ATTERBERG LIMITS (ASTM D-4318)



SOIL DATA

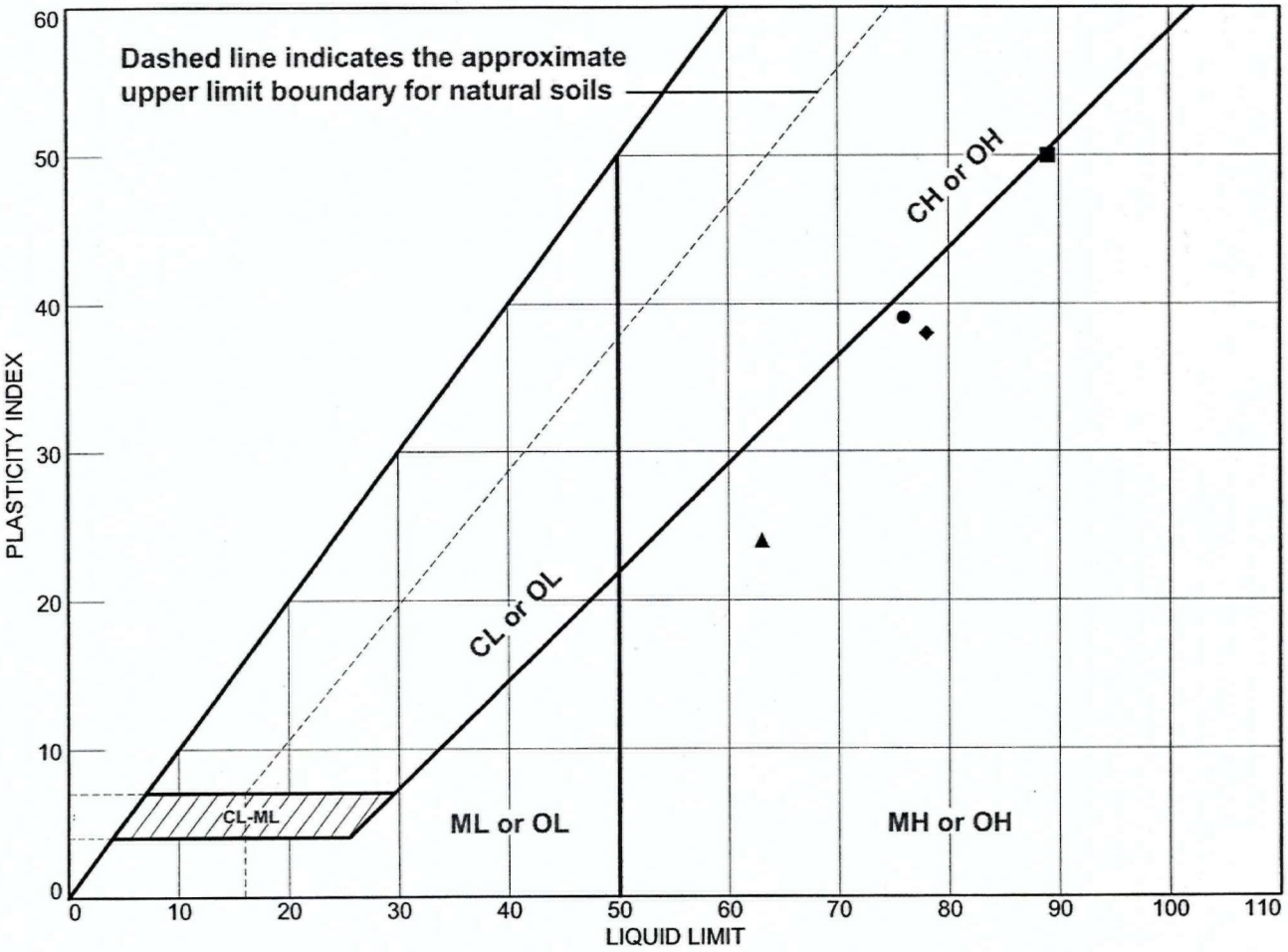
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	EB-2	ST-1	2.1-2.2	53.2	32	44	12	ML
■	EB-2	ST-2	4.0-4.1 ft.	63.6	34	56	22	MH
▲	EB-2	ST-7	16.7-16.8ft	74.2	36	61	25	MH
◆	EB-2	ST-8	19.7-19.8ft	44.1	28	48	20	ML
▼	EB-2	ST-9	21.3-21.4ft	29.5	24	23	0	ML

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 **Figure** 1

Tested By: Kristin A. Sheets **Checked By:** RGS

ATTERBERG LIMITS (ASTM D-4318)



SOIL DATA

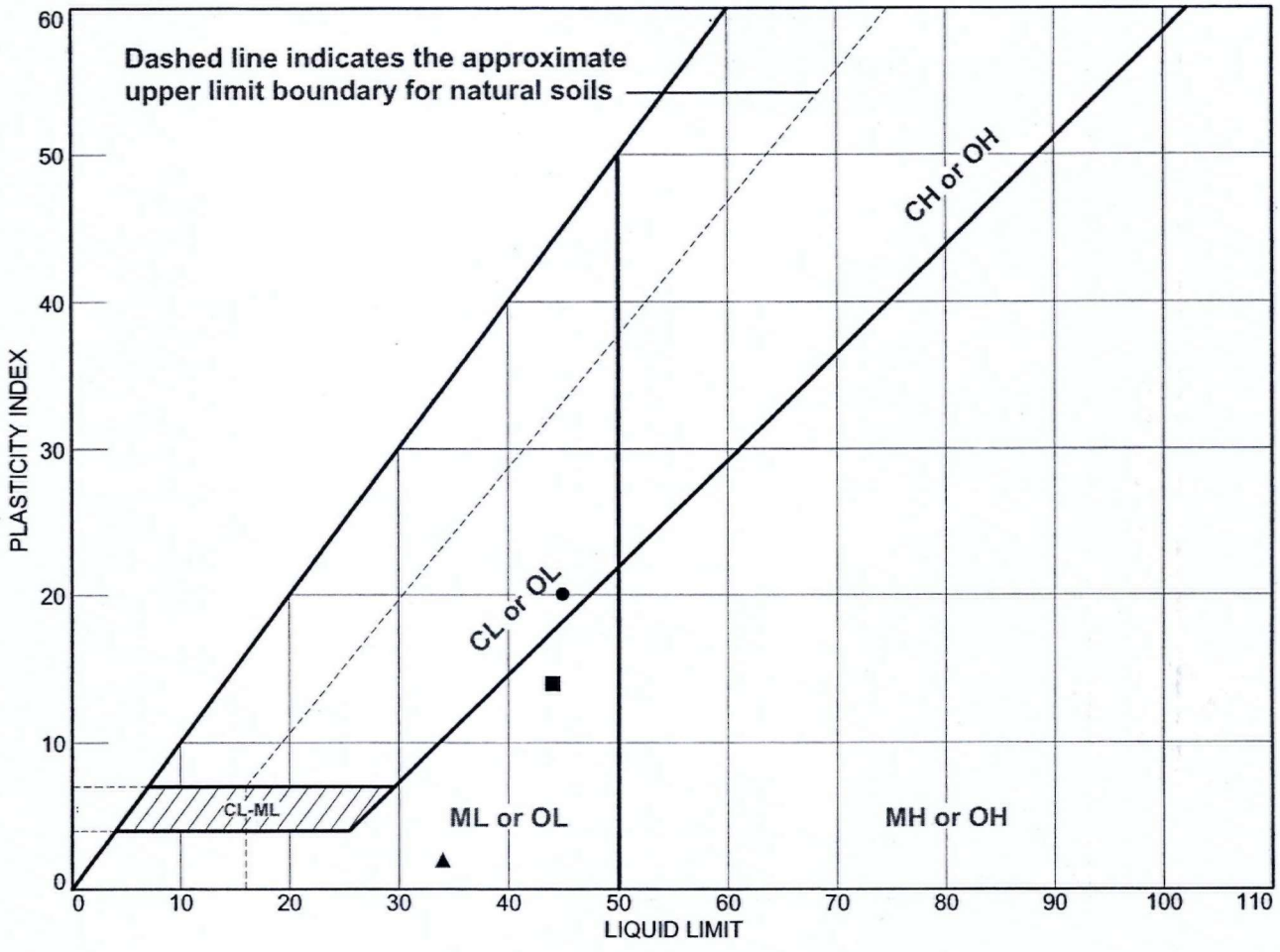
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SW-1-1	SS-8	17.5-19.0 ft	72.7	37	76	39	MH
■	SW-1-1	ST-1	1.8-2.0 ft	81.1	39	89	50	CH
▲	SW-1-1	ST-3	6.1-6.2 ft	65.6	39	63	24	MH
◆	SW-1-1	ST-9	20.2-20.3 ft	61.6	40	78	38	MH

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 **Figure** 2

Tested By: Kristin A. Sheets **Checked By:** _____

ATTERBERG LIMITS (ASTM D-4318)



SOIL DATA

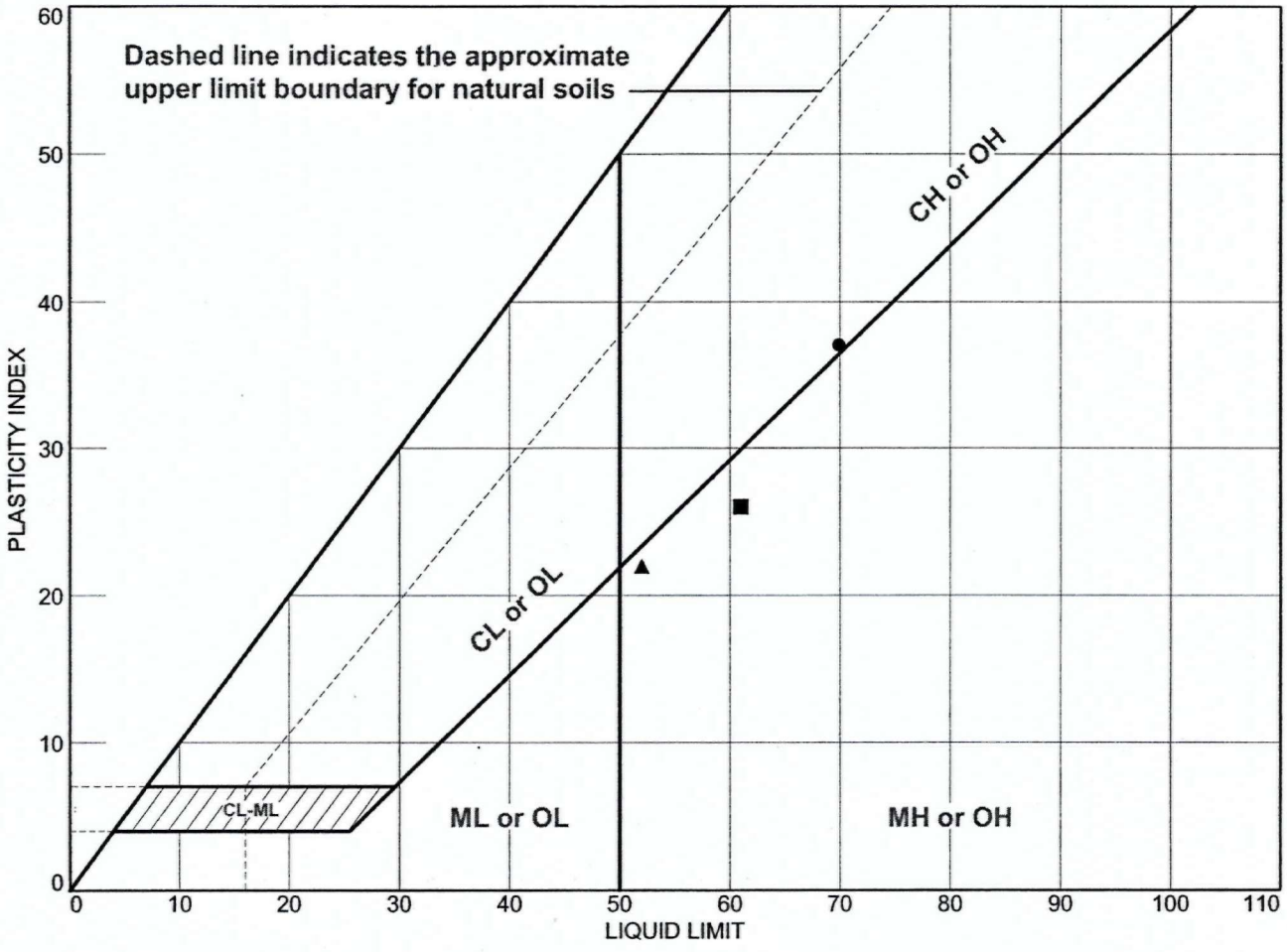
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SW-1-2	VS-4	14.2	41.3	25	45	20	CL
■	SW-3-1	ST-3	11.7-12.0 ft	41.9	30	44	14	ML
▲	SW-3-1	ST-5	16.7-17.0 ft	34.5	32	34	2	ML

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 **Figure** 3

Tested By: Kristin A. Sheets **Checked By:** _____

ATTERBERG LIMITS (ASTM D-4318)



SOIL DATA

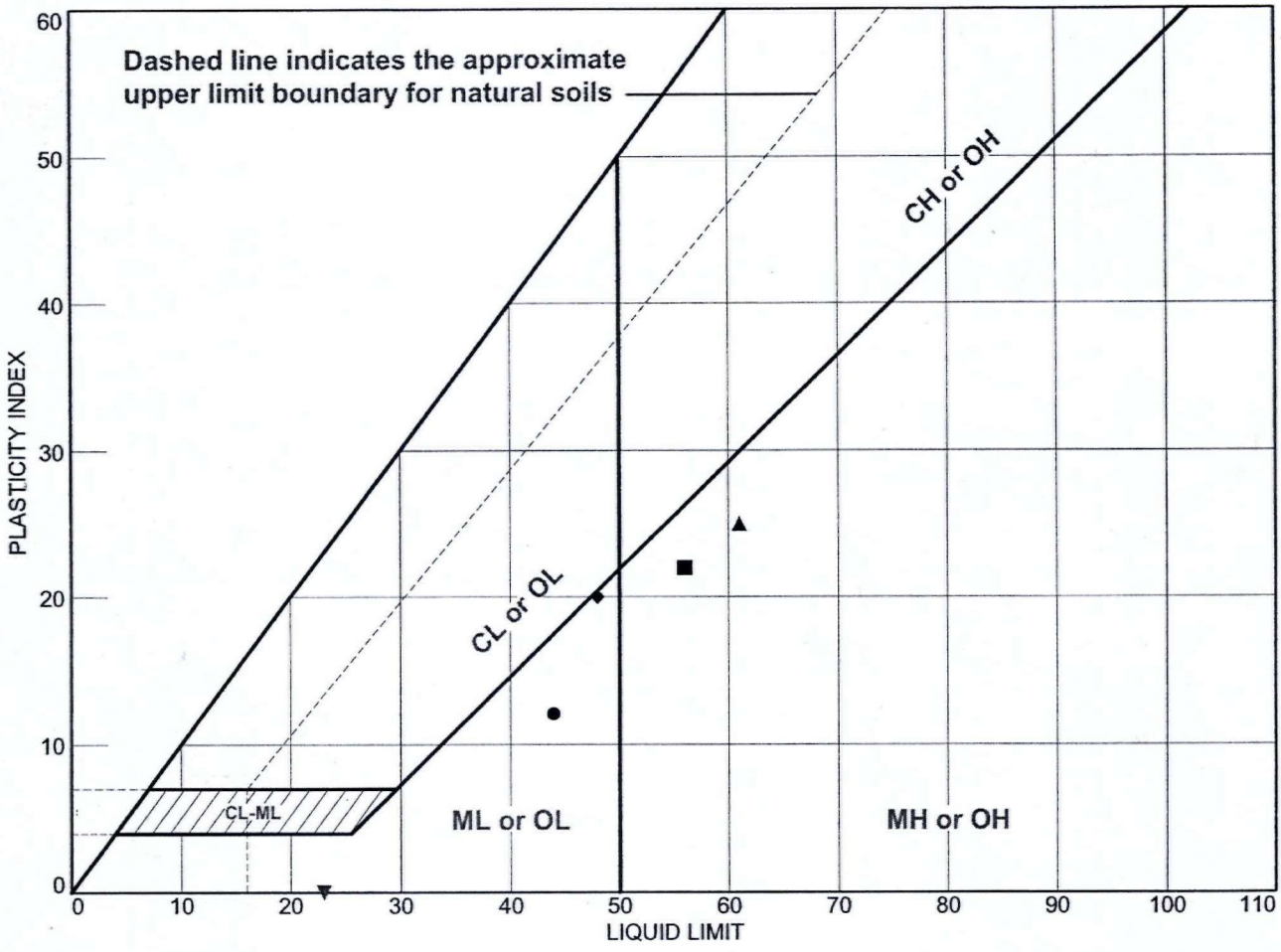
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SW-1-3	ST-5	11.0-11.1	65.3	33	70	37	CH
■	SW-1-3	VS-3	---	84.9	35	61	26	MH
▲	SW-2-1B	ST-3	9.5-9.6 ft.	54.8	30	52	22	MH

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 **Figure** 4

Tested By: _____ **Checked By:** _____

ATTERBERG LIMITS (ASTM D-4318)



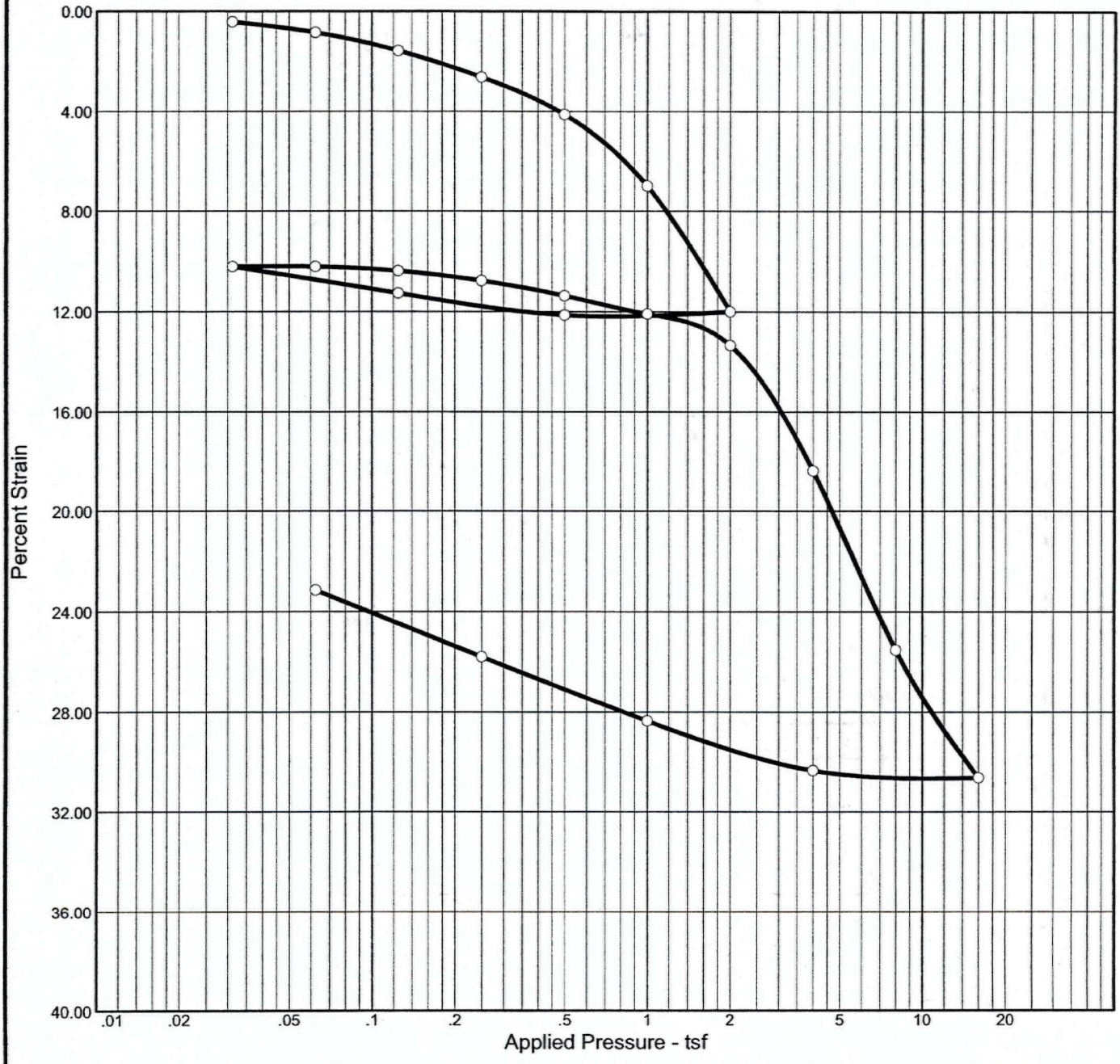
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	EB-2	ST-1	2.1-2.2	53.2	32	44	12	ML
■	EB-2	ST-2	4.0-4.1 ft.	63.6	34	56	22	MH
▲	EB-2	ST-7	16.7-16.8ft	74.2	36	61	25	MH
◆	EB-2	ST-8	19.7-19.8ft	44.1	28	48	20	ML
▼	EB-2	ST-9	21.3-21.4ft	29.5	24	23	0	ML

SOIL TECHNOLOGY

Client: CH2MHill
Project: Milltown Bridge Mitigation Project
Project No.: J-06-2143 **Figure** 1

Tested By: Kristin A. Sheets **Checked By:** RGS

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
99.7 %	60.7 %	98.2	52	22	2.6	CH		1.582

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: SW-2-1B,ST-3 Depth 9.5-9.6 ft.

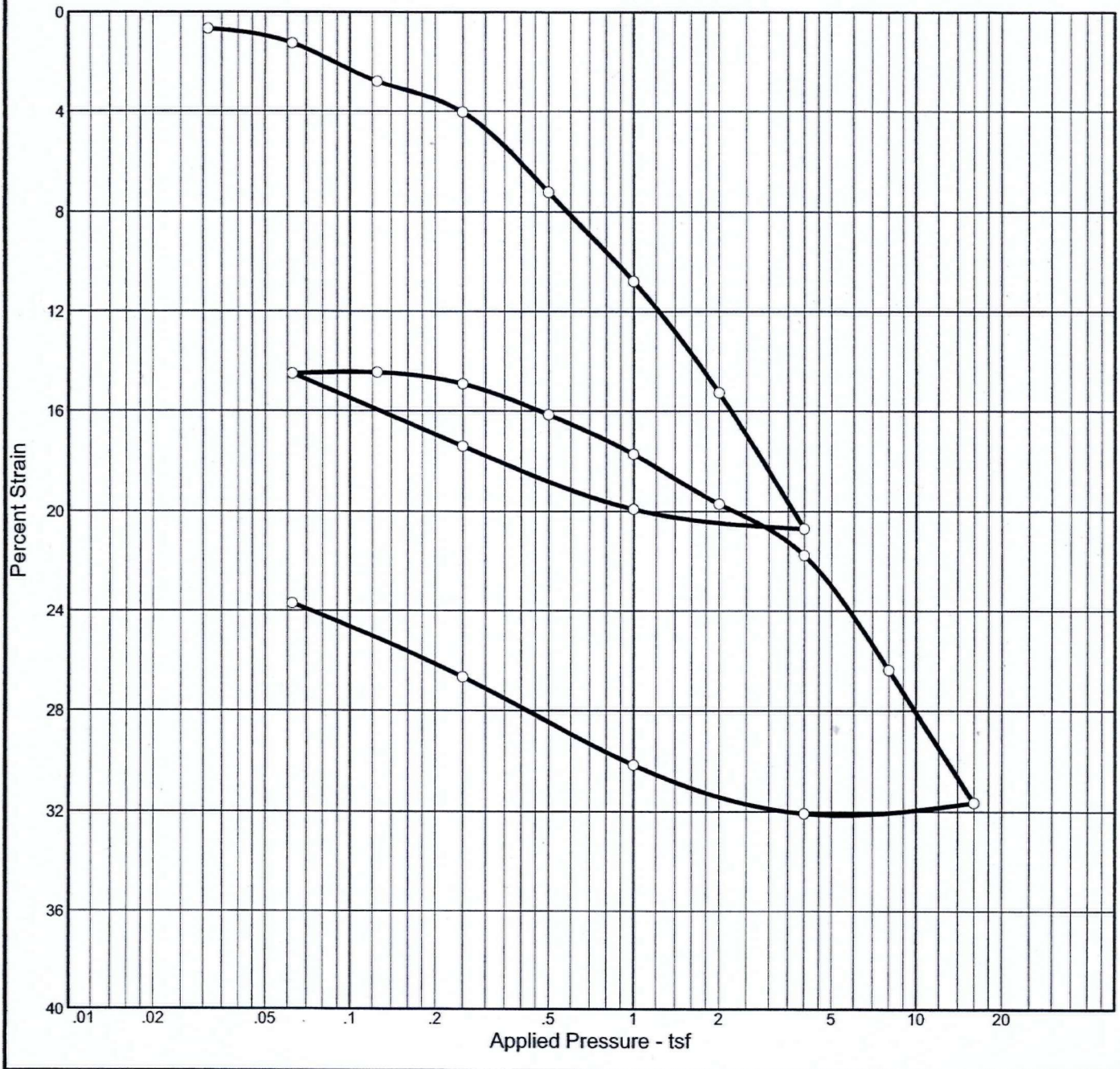
Remarks:
Soft,wet,Clay

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

Consol Plot 7

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
100.5 %	72.3 %	57.3			2.7			1.944

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: SW-1-1 ST-9 Depth 20.2-20.3 ft.

Remarks:

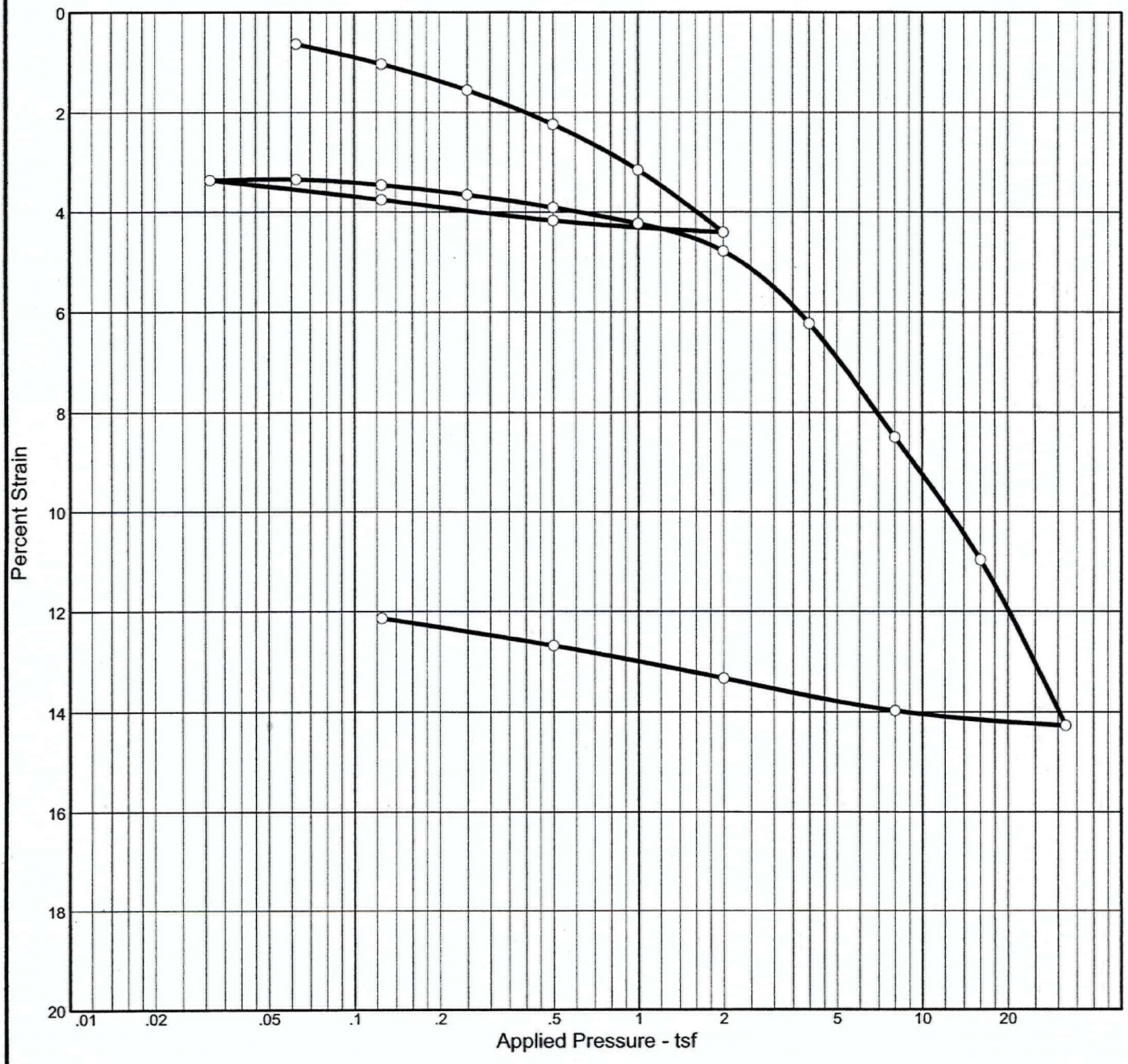
Very soft,wet,grey Clay CH-CL top of sample contained small sand lense

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

Consol Plot

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
98.9 %	29.5 %	93.0	24	GNP	2.65	ML	----	0.791

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: EB-2,ST-9 Depth 21.3-21.4 ft.

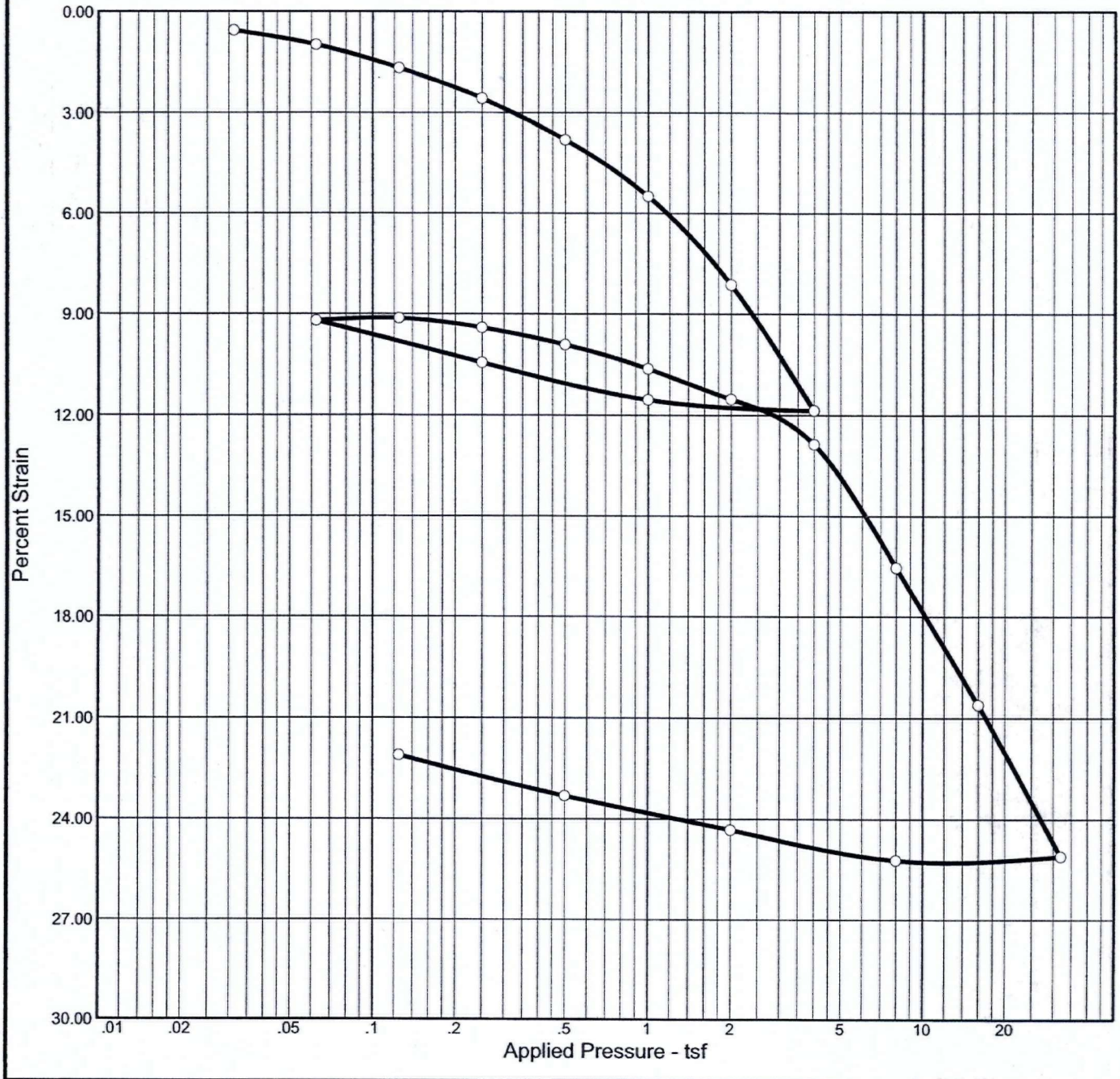
Remarks:
LL=PL Granular non-plastic

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

Consol Plot 3

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
94.1 %	39.2 %	80.0	48	20	2.65	ML		1.105

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: EB-2,ST-8 Depth 19.7-19.8 ft.

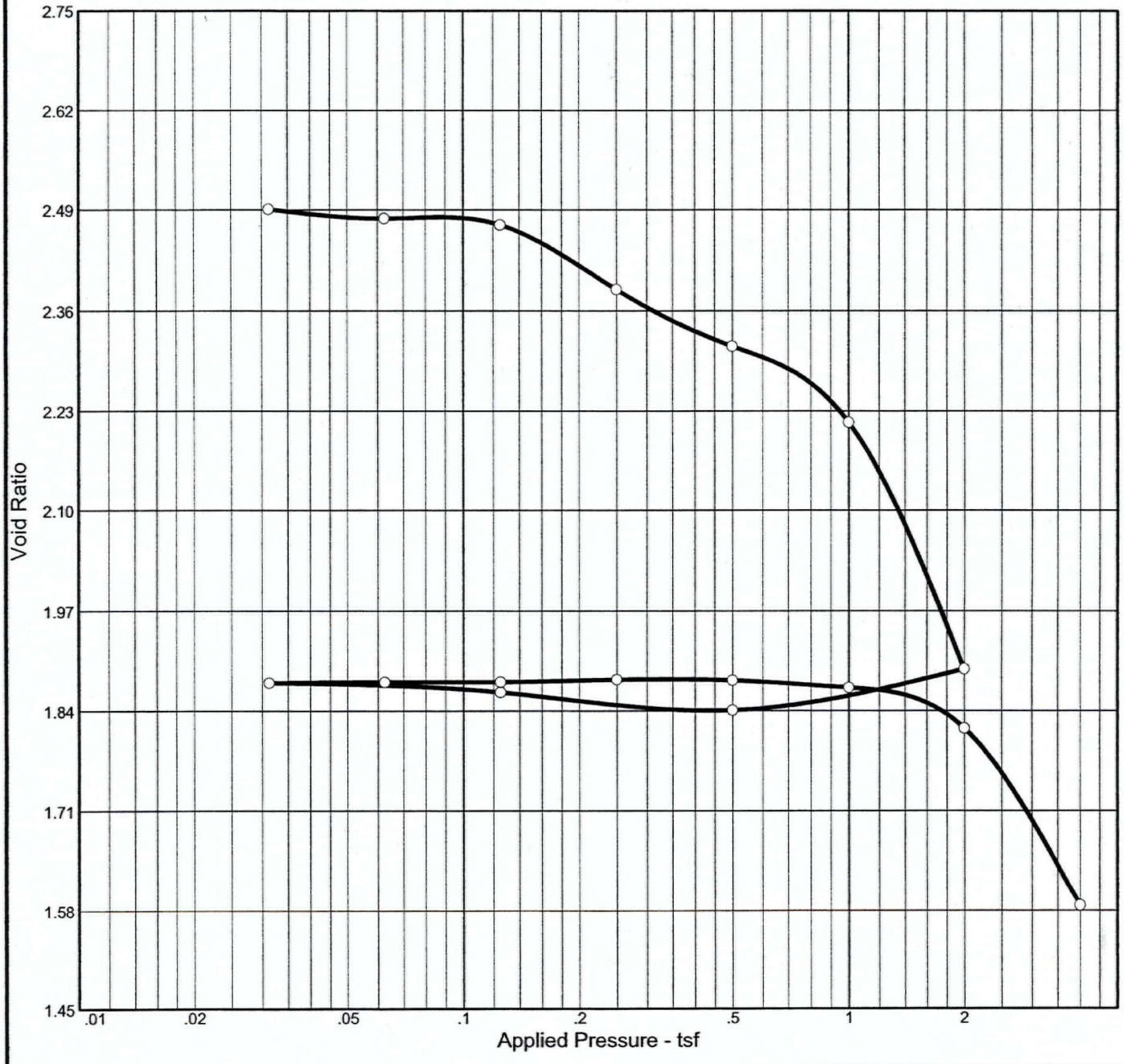
Remarks:

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

Consol Plot 2

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
101.9 %	96.8 %	47.0	61	25	2.65	MH		2.516

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: EB-2,ST-7 Depth 16.7-16.8 ft.

Remarks:

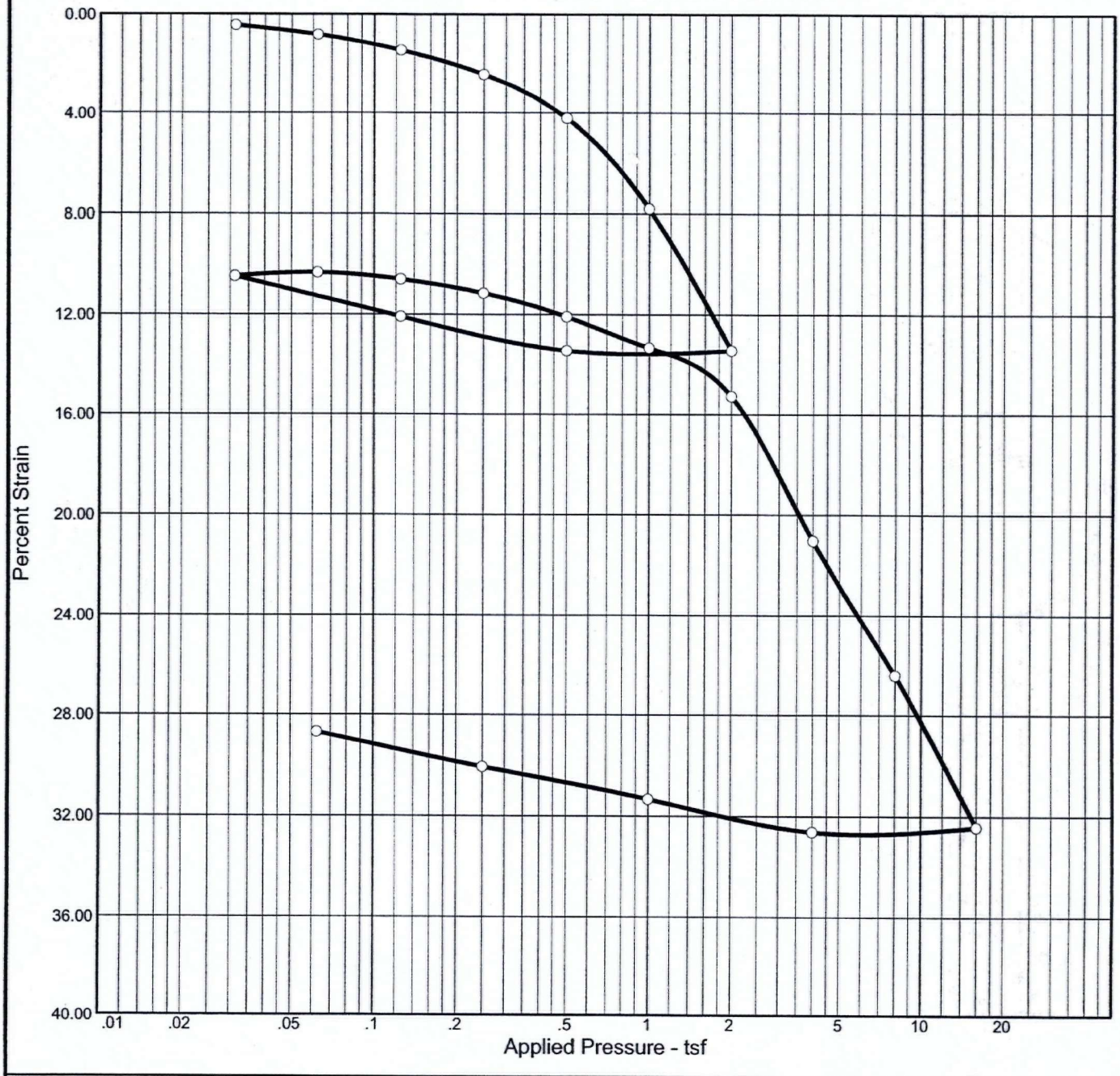
Very soft,wet, grey Silt
During 8 tsf laod ran out of travel, use results with caution

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

Consol Plot 1

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
98.8 %	63.8 %	59.4			2.65			1.712

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: EB-2,ST-2 Depth 4.0-4.1 ft.

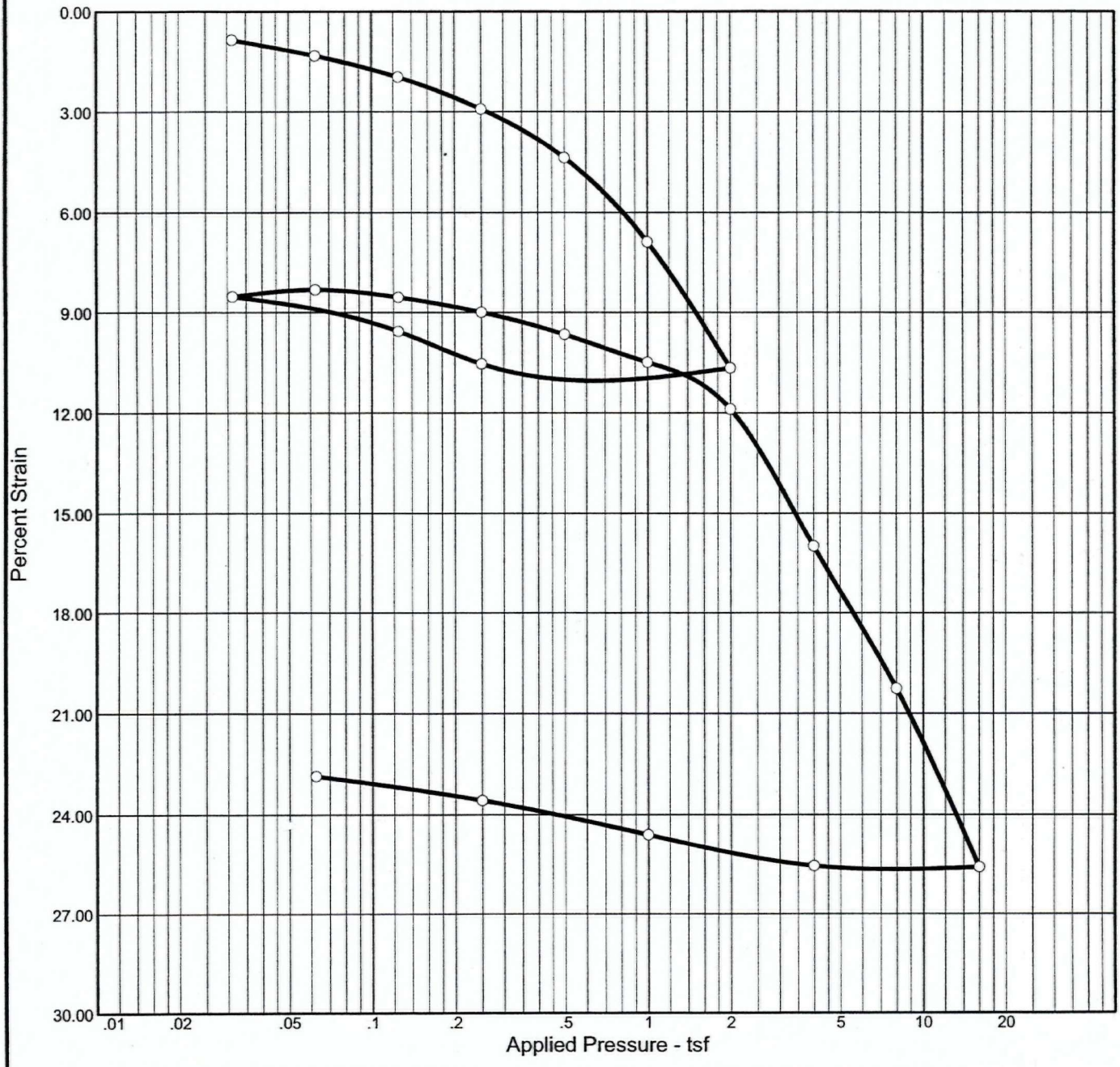
Remarks:

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

Consol Plot 5

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.3 %	49.4 %	71.0	44	12	2.65	ML	---	1.346

MATERIAL DESCRIPTION

Project No. J-06-2143 **Client:** CH2MHill

Project: Milltown Bridge Mitigation Project

Location: EB-2,ST-1 Depth 2.1-2.2 ft.

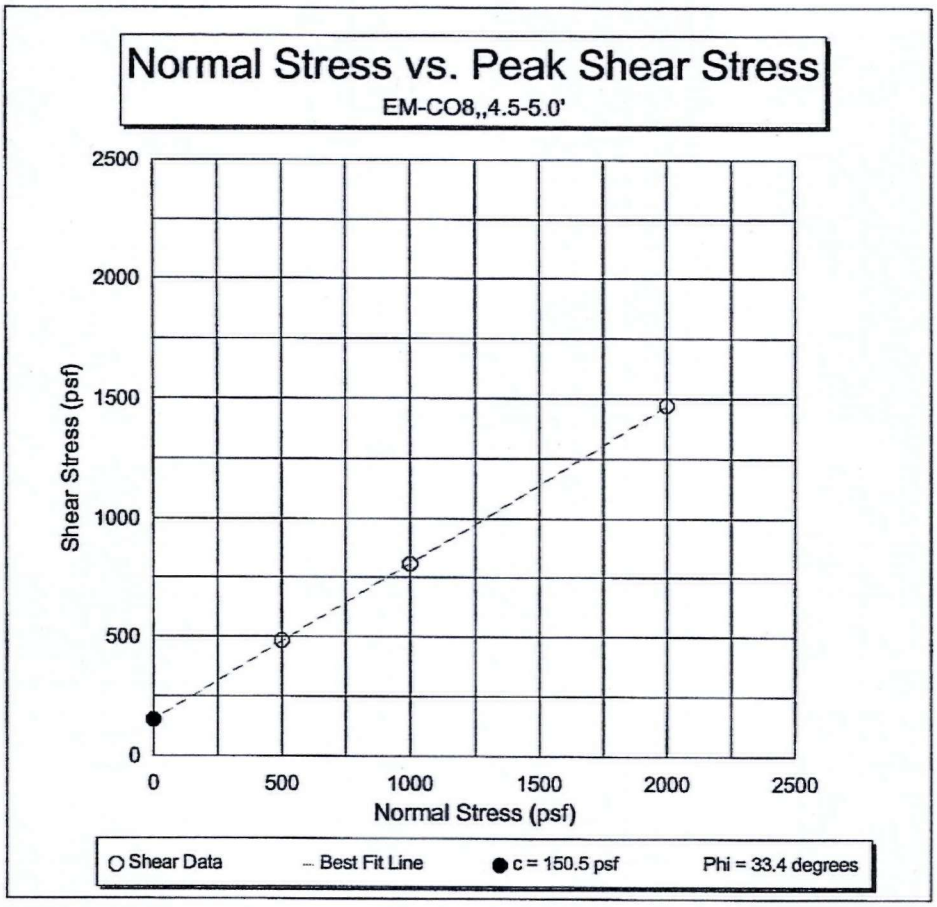
Remarks:

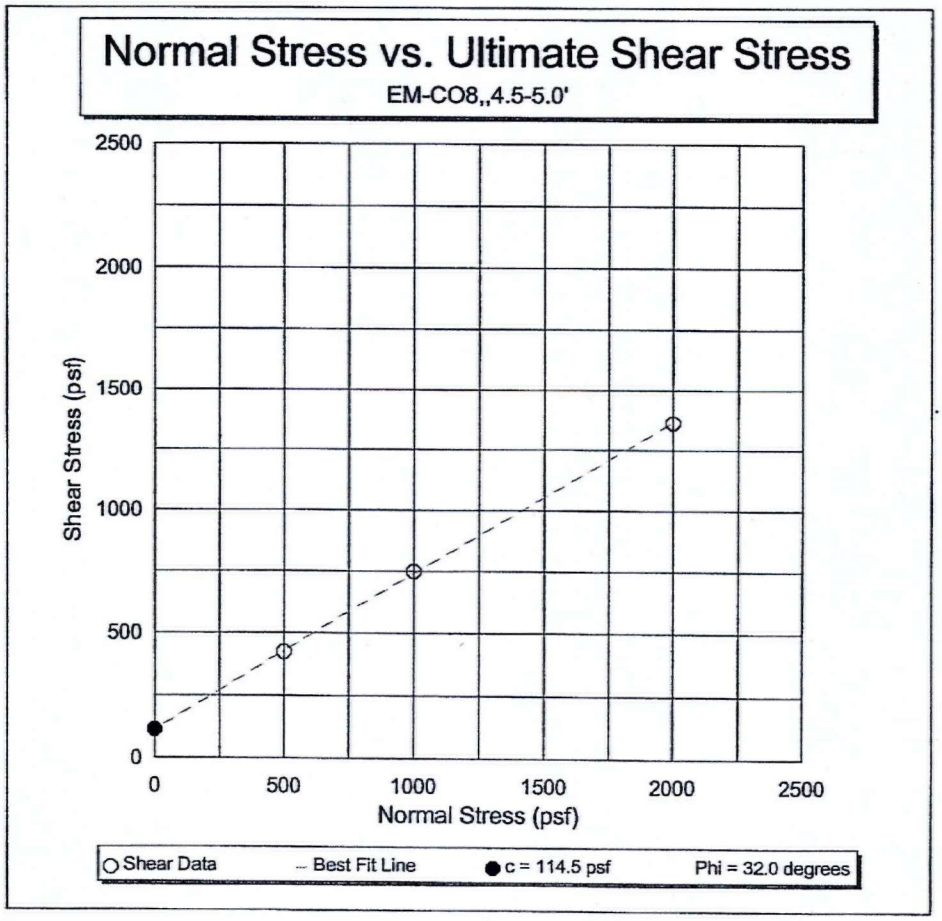
Sample was very soft,wet,tan,SILT with organic lenses and small roots

CONSOLIDATION TEST REPORT

SOIL TECHNOLOGY, INC.

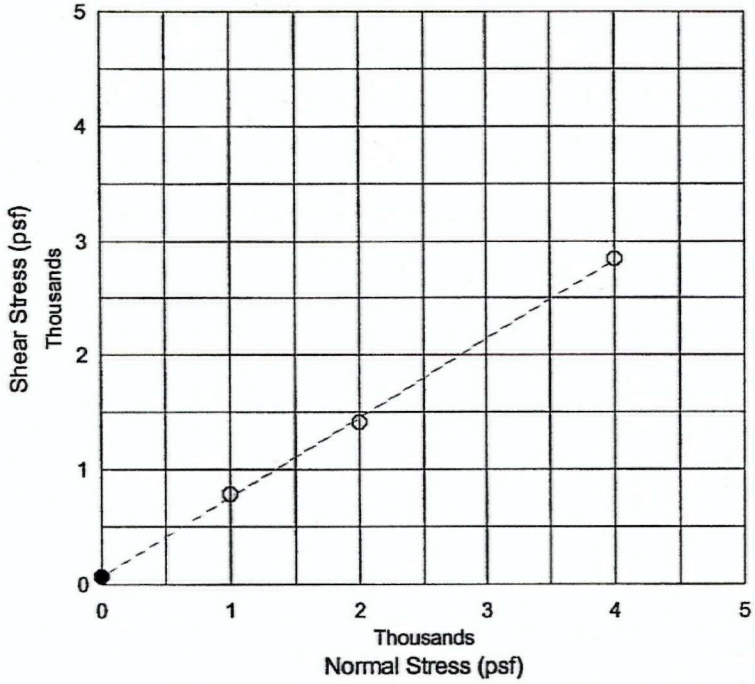
Consol Plot 4


Normal Stress vs. Peak Shear Stress
EM-CO8,,4.5-5.0'
Shear Stress (psf)
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
Normal Stress (psf)
Shear Data
Best Fit Line
c = 150.5 psf
Phi = 33.4 degrees


Normal Stress vs. Ultimate Shear Stress
EM-CO8,,4.5-5.0'
Shear Stress (psf)
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
Normal Stress (psf)
Shear Data
Best Fit Line
c = 114.5 psf
Phi = 32.0 degrees

Normal Stress vs. Peak Shear Stress

EM-C08,,15.0-17.0'

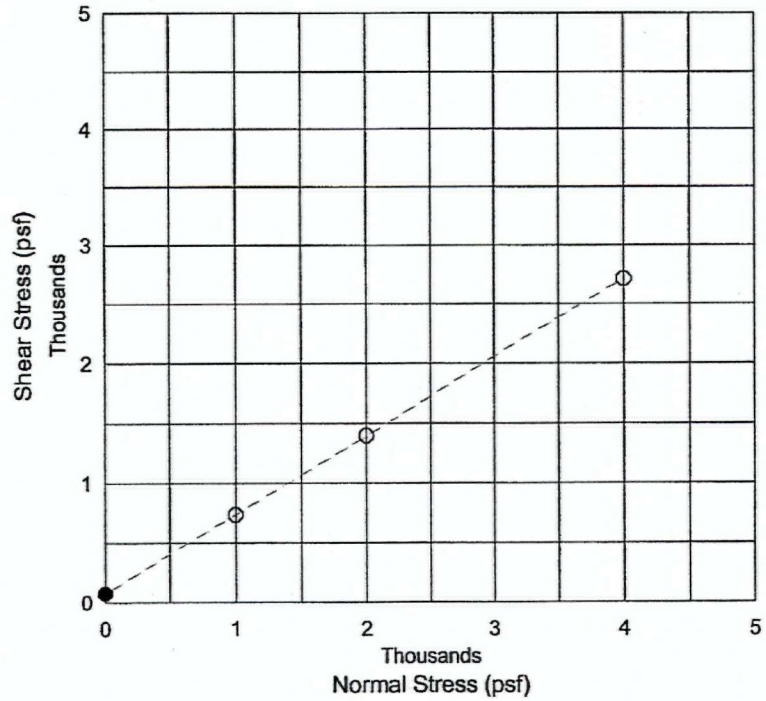


○ Shear Data -- Best Fit Line ● c = 66.5 psf Phi = 34.7 degrees

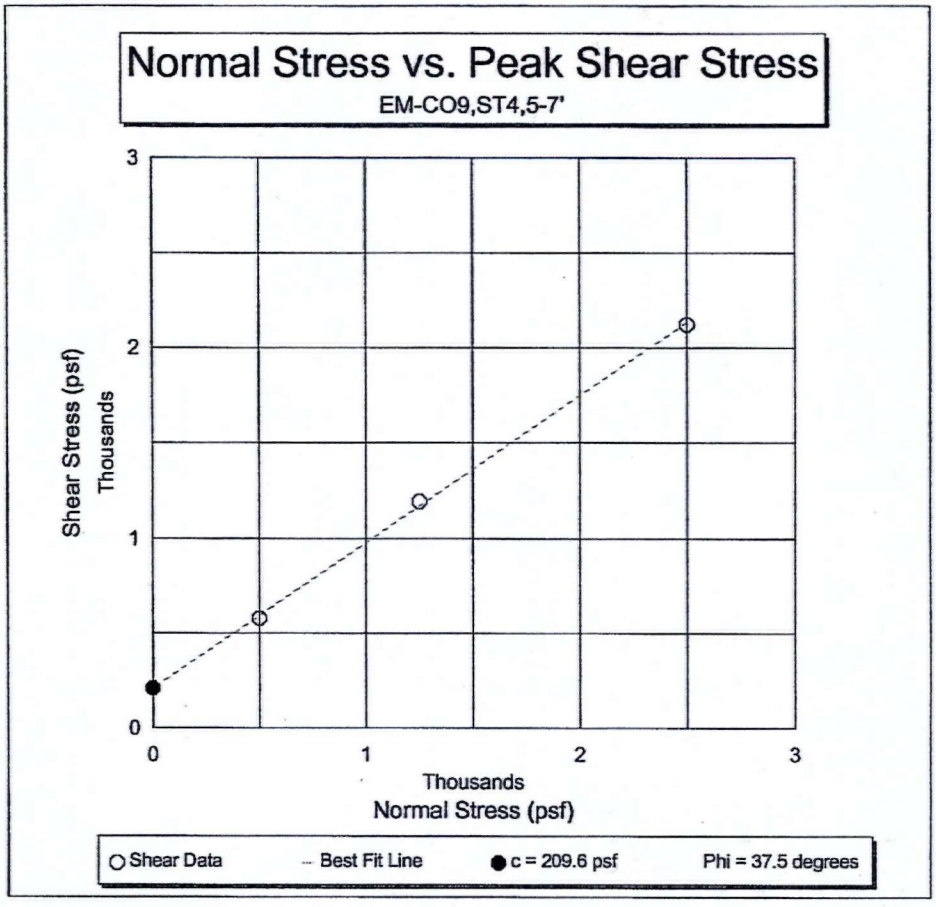
SILTY SAND

Normal Stress vs. Ultimate Shear Stress

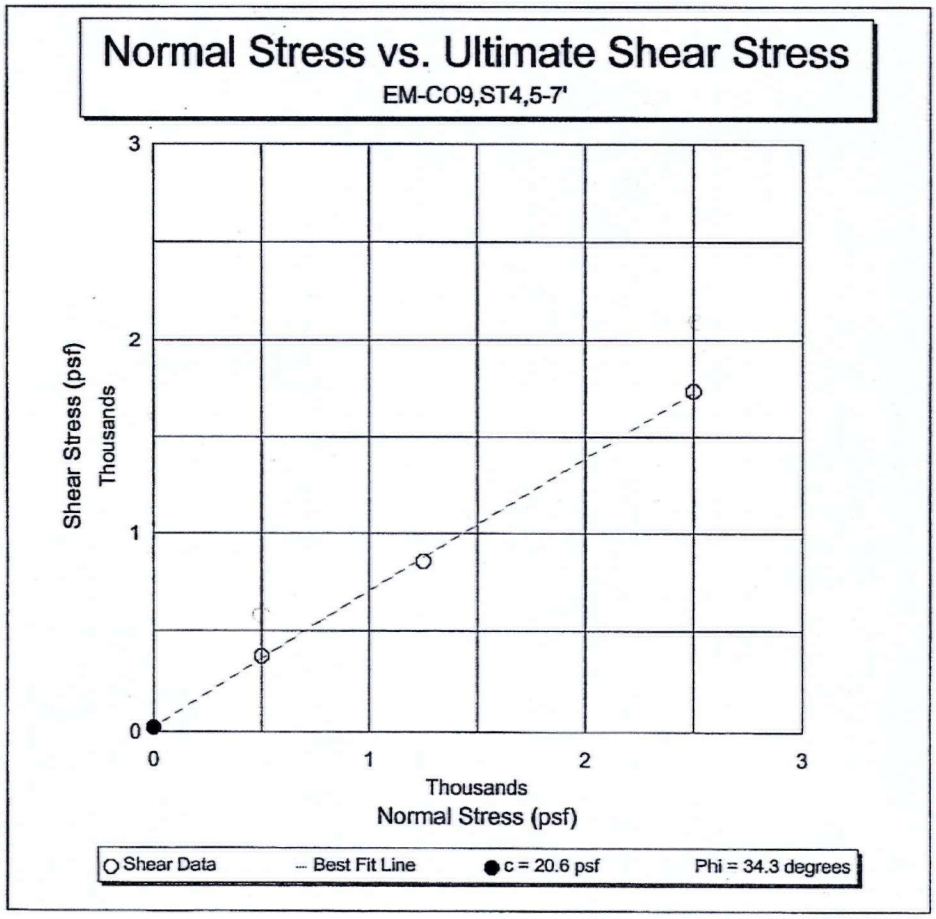
EM-C08,,15.0-17.0'

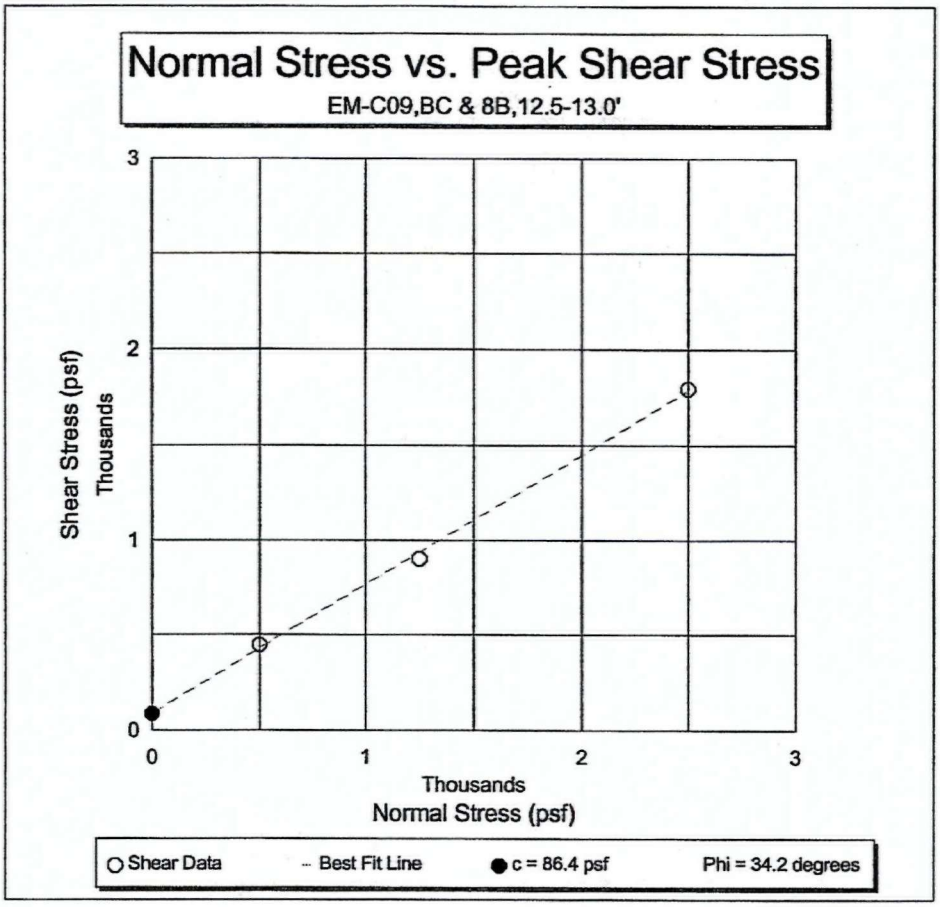


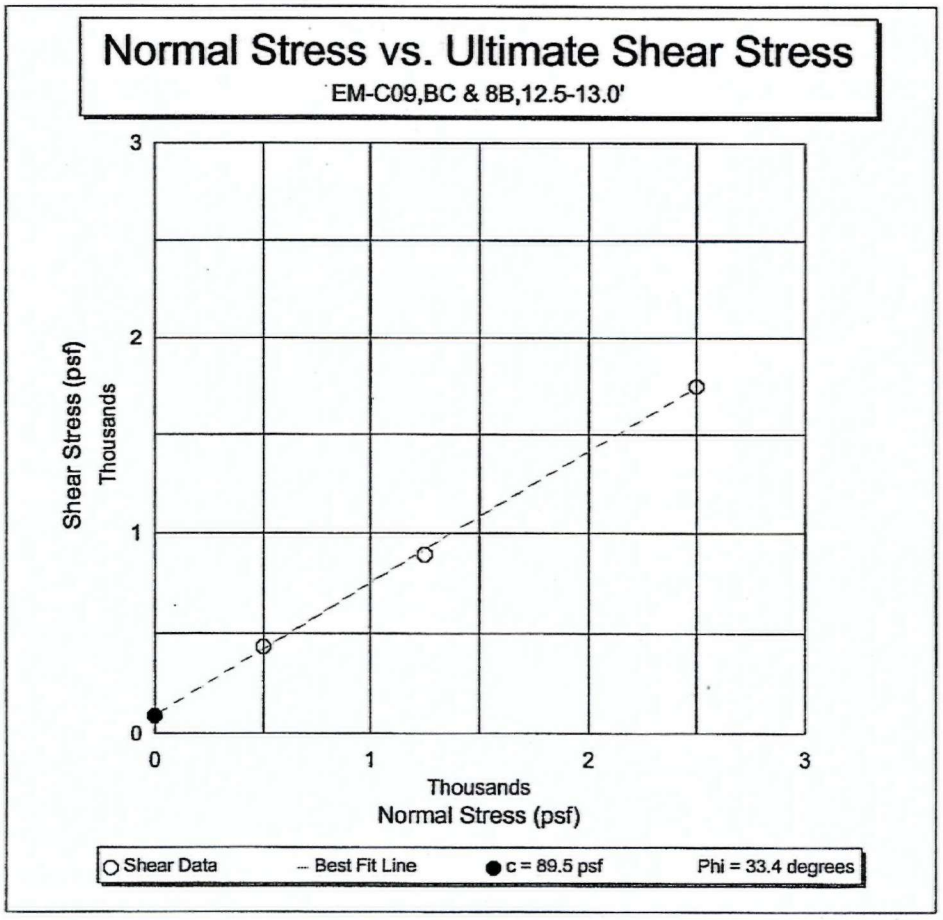
○ Shear Data -- Best Fit Line ● c = 79.0 psf Phi = 33.4 degrees


Normal Stress vs. Peak Shear Stress
EM-CO9,ST4,5-7'
Shear Stress (psf)
Thousands
0
1
2
3
0
1
2
3
Thousands
Normal Stress (psf)
Shear Data
Best Fit Line
c = 209.6 psf
Phi = 37.5 degrees

SP-SM

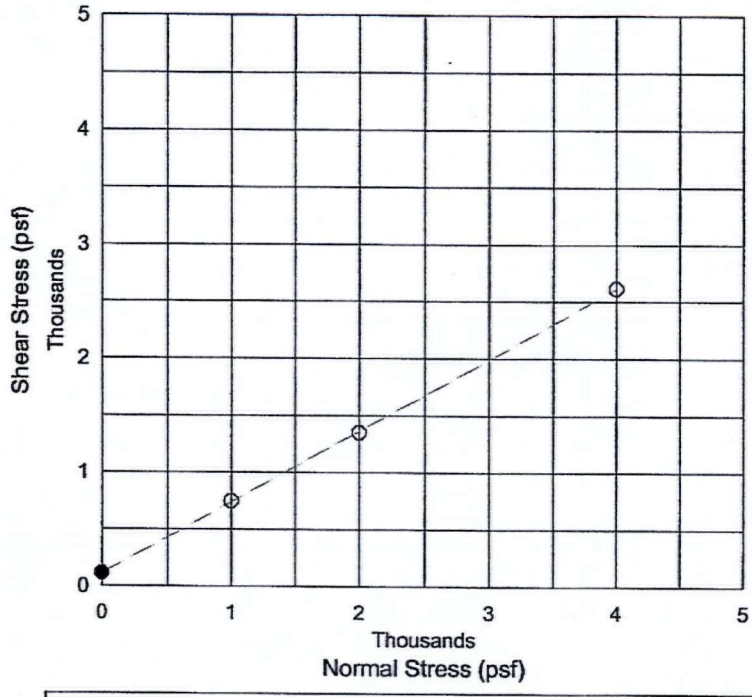

Normal Stress vs. Ultimate Shear Stress
EM-CO9,ST4,5-7'
Shear Stress (psf)
Thousands
0
1
2
3
0
1
2
3
Thousands
Normal Stress (psf)
Shear Data
Best Fit Line
c = 20.6 psf
Phi = 34.3 degrees


Normal Stress vs. Peak Shear Stress
EM-C09,BC & 8B,12.5-13.0'
Shear Stress (psf)
Thousands
0
1
2
3
Thousands
Normal Stress (psf)
Shear Data
Best Fit Line
c = 86.4 psf
Phi = 34.2 degrees


Normal Stress vs. Ultimate Shear Stress
EM-C09,BC & 8B,12.5-13.0'
Shear Stress (psf)
Thousands
0
1
2
3
Thousands
Normal Stress (psf)
Shear Data
Best Fit Line
c = 89.5 psf
Phi = 33.4 degrees

Normal Stress vs. Peak Shear Stress

EM-CO9,ST #10,15-17'

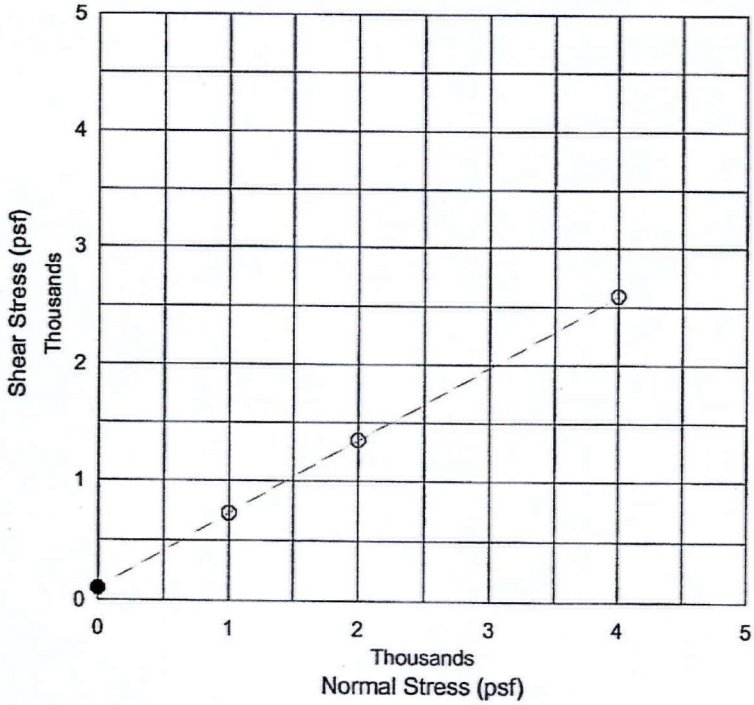


○ Shear Data -- Best Fit Line ● c = 115.0 psf Phi = 32.0 degrees

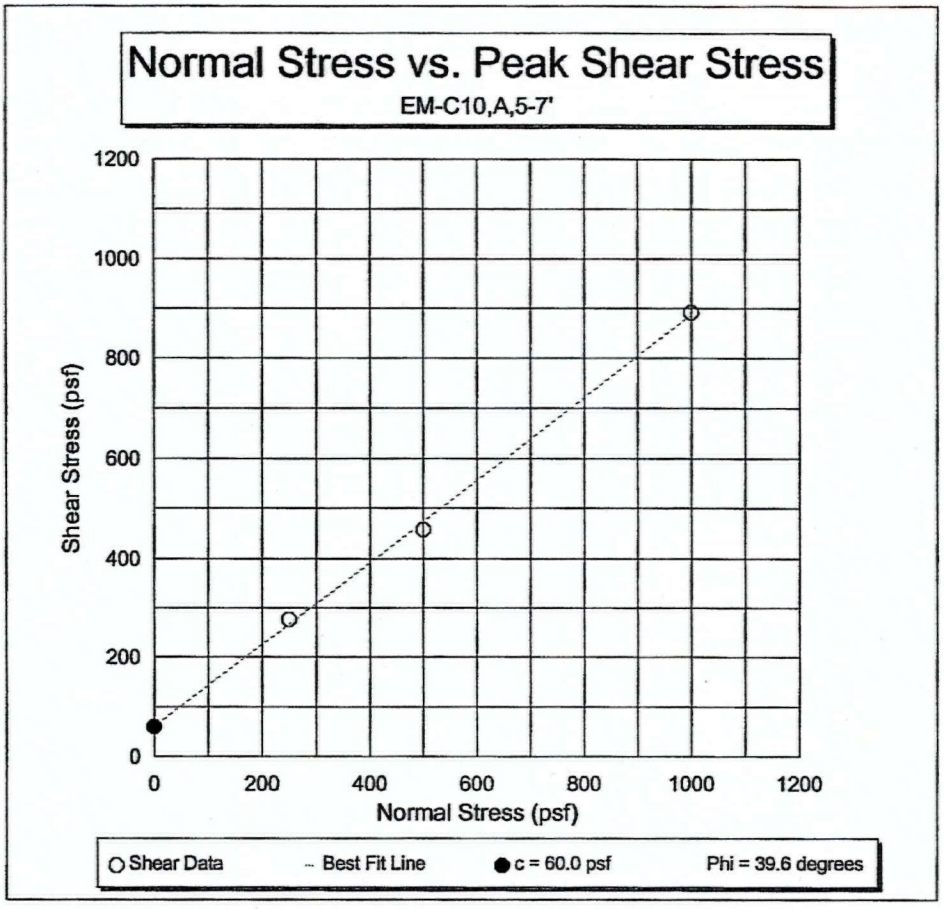
ML

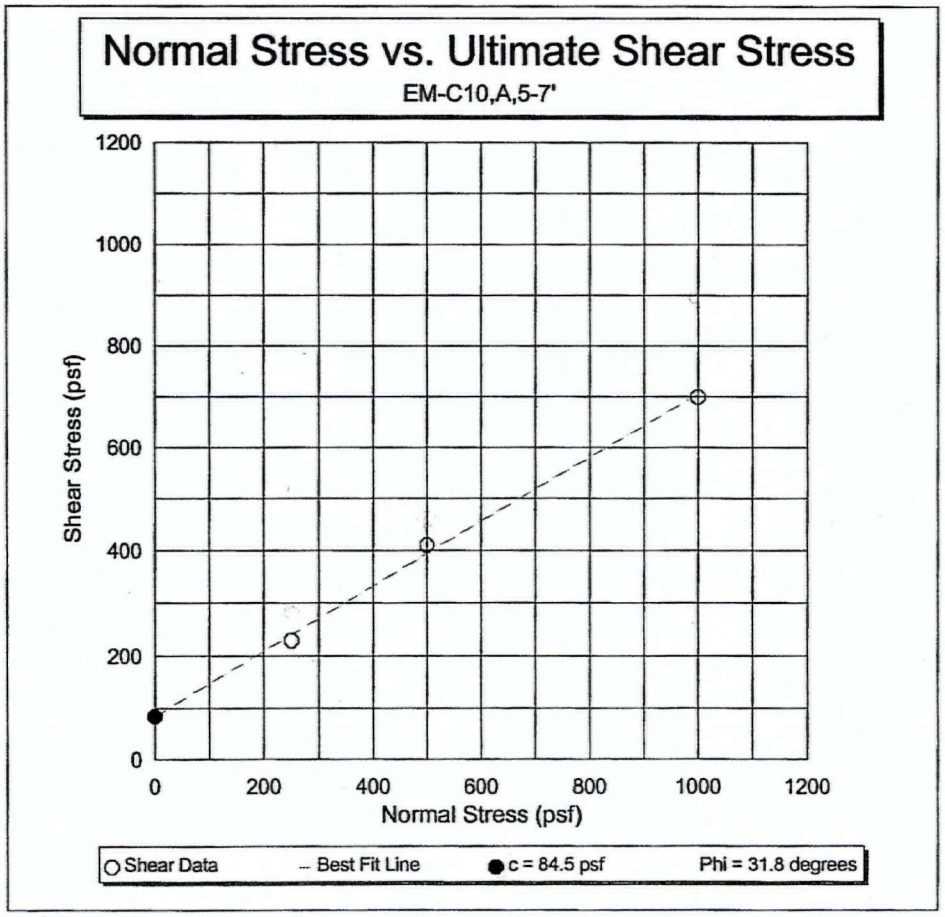
Normal Stress vs. Ultimate Shear Stress

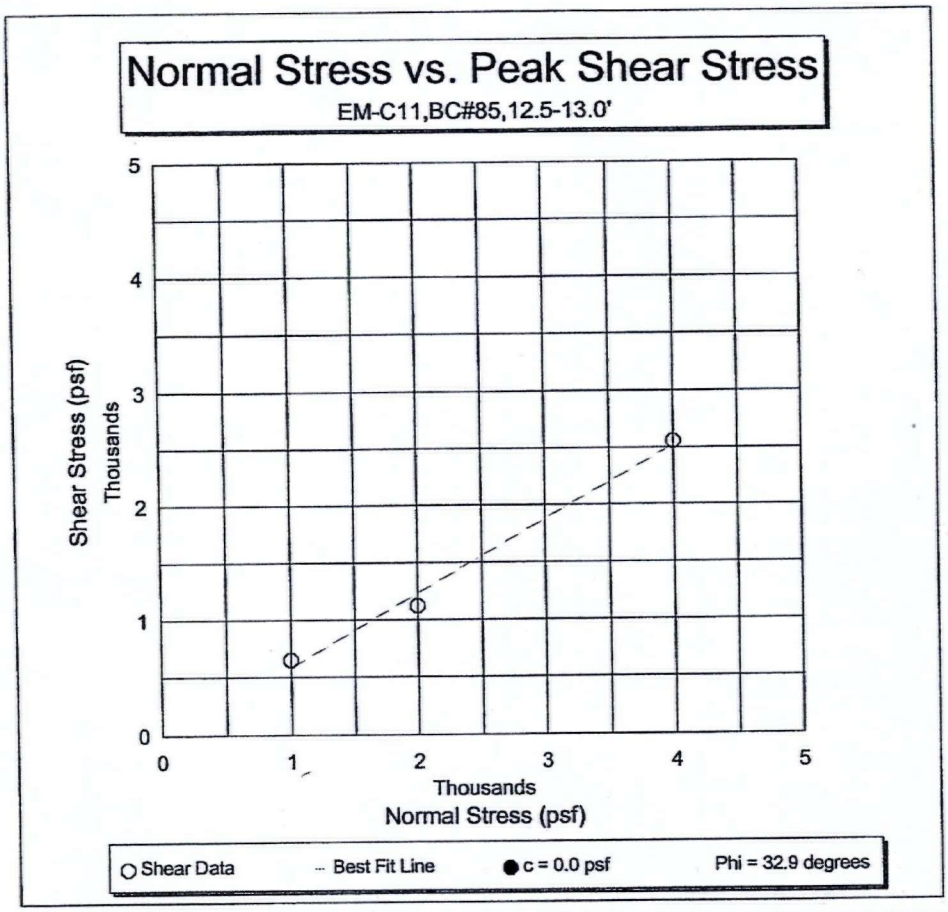
EM-CO9,ST #10,15-17'

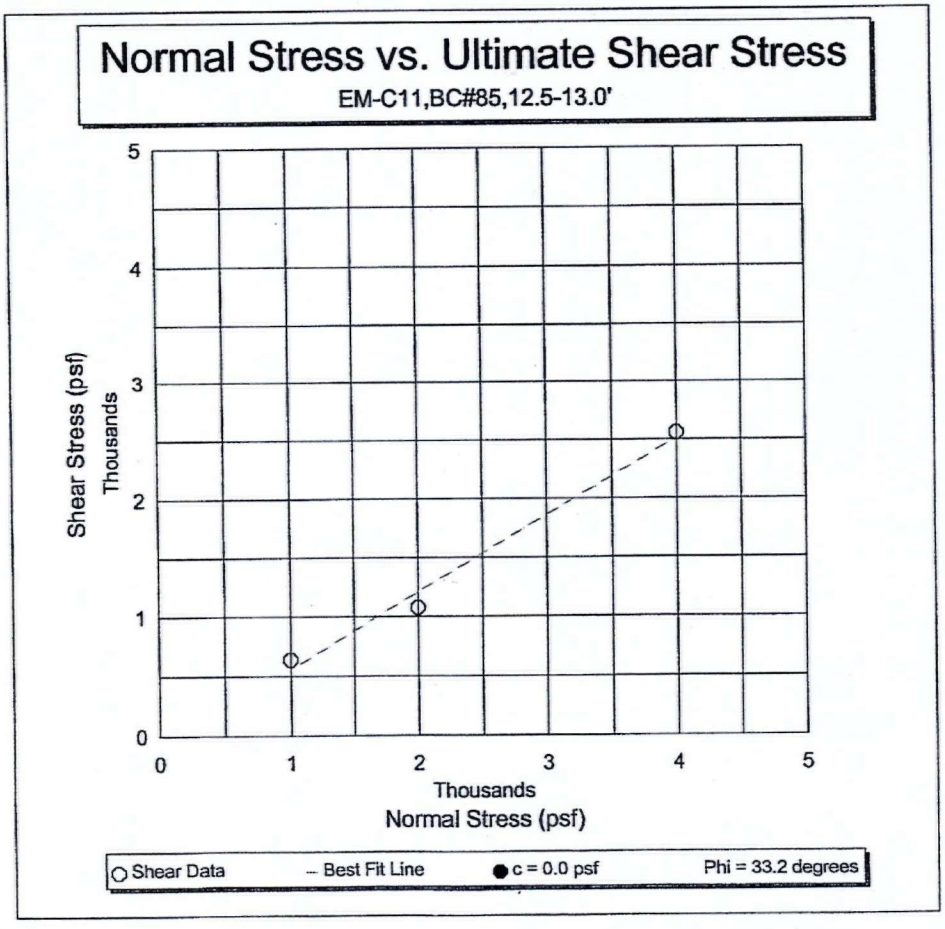


○ Shear Data -- Best Fit Line ● c = 103.0 psf Phi = 31.9 degrees


Normal Stress vs. Peak Shear Stress
EM-C10,A,5-7'
Shear Stress (psf)
Normal Stress (psf)
0
200
400
600
800
1000
1200
Shear Data
Best Fit Line
c = 60.0 psf
Phi = 39.6 degrees


Normal Stress vs. Ultimate Shear Stress
EM-C10,A,5-7'
Shear Stress (psf)
Normal Stress (psf)
0
200
400
600
800
1000
1200
Shear Data
Best Fit Line
c = 84.5 psf
Phi = 31.8 degrees


Normal Stress vs. Peak Shear Stress
EM-C11,BC#85,12.5-13.0'
Shear Stress (psf)
Thousands
0
1
2
3
4
5
Thousands
Normal Stress (psf)
Shear Data
Best Fit Line
c = 0.0 psf
Phi = 32.9 degrees


Normal Stress vs. Ultimate Shear Stress
EM-C11,BC#85,12.5-13.0'
Shear Stress (psf)
Thousands
0
1
2
3
4
5
Thousands
Normal Stress (psf)
Shear Data
Best Fit Line
c = 0.0 psf
Phi = 33.2 degrees